

BULKY DOCUMENTS

(Exceeds 300 pages)

Proceeding/Serial No: 91173105

Filed: 10-28-08

Title: NOTICE OF FILING OF TESTIMONY

Part 2 of 4



One solution is to show the trending vertically using a bar chart. (See Figure 7-11.) With a bar chart, you have room to label the data points and keep the chart to a reasonable size. This isn't something to aspire to, however. Trending vertically isn't as intuitive and may not convey your information in a very readable form. Nevertheless, this solution can prove to be just the workaround you need when the horizontal view proves to be impractical.

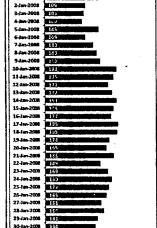


Figure 7-11:
A bar chart can prove to be effective when trending days extending to 30 or more data points.

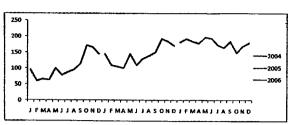
Comparative Trending

Although the name is fancy, *comparative trending* is a simple concept. You chart two or more data series on the same chart so that the trends from those series can be visually compared. In this section, you walk through a few techniques that allow you to build components that present comparative trending.

Creating side-by-side time comparisons

Figure 7-12 shows a chart that presents a side-by-side time comparison of three time periods. With this technique, you can show different time periods in different colors without breaking the continuity of the overall trending.

Figure 7-12: You can show trends for difference periods side-byside.



1. To create this type of chart, you would structure a table similar to the one shown in Figure 7-13.

Note that instead of placing the all the data into one column, you're staggering the data into respective years. This tells the chart to create three separate lines (allowing for the three colors).

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3			
No.			
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1		193	
120		185	
100			
1			182
			193
			185
		88 63 95 95 115 9 172 Na 165 D 146 146	88

Figure 7-13:
The data table needed to create side-by-side trending.

2. When you have your data in the correct structure, simply highlight the entire table and create a line chart.

This automatically creates the chart shown in Figure 7-12.

If you want to get a bit fancy, click the chart to select it, and then right-click. Choose Change Chart Type from the context menu that activates.

4. When the Change Chart Type dialog box opens, select Stacked Column Chart.

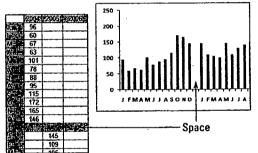
As you can in Figure 7-14, your chart now shows the trending for each year in columns.

Would you like a space in between the years? Adding a space in the data table (between each 12 month sequence) adds a space in the chart. (See Figure 7-15.)

Figure 7-14:
Change the
chart type to
Stacked
Column
Chart to
present
columns
instead of
lines.



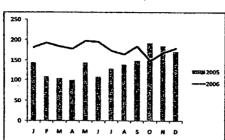
Figure 7-15:
If you want
to separate
each year
with a
space,
simply add a
space into
the source
data table.



Creating stacked time comparisons

The stacked time comparison places two series on top of each other instead of side-by-side. Although this removes the benefit of having an unbroken overall trending, it replaces it with the benefit of an at-a-glance comparison within a compact space. Figure 7-16 illustrates a common stacked time comparison.

Figure 7-16:
A stacked time comparison allows you to view and compare two years of data in a compact space.



1. To create this chart, create a new table and structure it like the one shown in Figure 7-17.

Figure 7-17: Start with a table containing the data for two time periods.

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1/2	100	7.70	
	145	182	H
3 ·	109	193	H
程第一世	105	185	
	100	179	
N658844	145	198	
16.	109	195	
20 Vent 18	130	174	
297	140	165	
到成了多	150	185	
200	193	149	
124 6	185	169	
SECTION :	171	180	

- 2. Highlight the entire table and create a column chart.
- 3. Select and right-click any of the bars for the 2006 data series and then choose Change Chart Type.
- 4. When the Change Chart Type dialog box opens, select the Line with Markers type.



This technique works well with two time series. You generally want to avoid stacking any more than that. Stacking more than two series often muddies the view and causes users to constantly reference the legend to keep track of the series they're evaluating.

Trending with a secondary axis

In some trending components, you'll have series that trends two very different units of measure. For instance, in Figure 7-18, you have a table that shows a trend for People Count and a trend for % of Labor Cost.

Figure 7-18:
You often
need to
trend two
very
different
units of
measure,
such as
counts and
percentages.

4 55 AS	ALCOHOLD STATE	Car Car
200	HOLE BOOK	Maria 1922
24	145	20%
	109	21%
VS.	105	23%
35 N	100	23%
	145	24%
10	109	25%
	130	24%
E	140	25%
F(0)	150	24%
湖 正	193	26%
02	185	28%
(E)	171	29%
E474		

These are two very different units of measure, that when charted, produce the unimpressive chart you see in Figure 7-19. Because Excel builds the vertical axis to accommodate the largest number, the percentage of labor cost trending gets lost at the bottom of the chart. Even a logarithmic scale doesn't help in this scenario.

Because the default vertical axis (or primary axis) doesn't work for both series, the solution is to create another axis to accommodate the series that doesn't fit into the primary axis. This other axis is the *secondary axis*.

To place a data series on the secondary axis, follow these steps:

1. Right-click the data series and choose Format Data Series.

The Format Data Series dialog box appears. (See Figure 7-20.)



Technically, it doesn't matter which data series you place on the secondary axis. A general rule is to place the problem data series on the secondary axis. In this scenario, because the data series for percentage of labor cost seems to be the problem, I place that series on the secondary axis.

Figure 7-19: The trending for percentage of labor cost gets lost at the bottom of the chart.

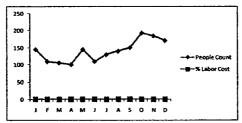
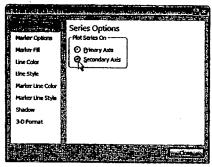


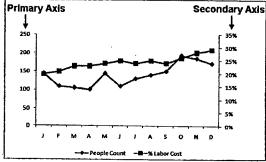
Figure 7-20: Placing a data series on the secondary axis.



In the Format Data Series dialog box, select the Series Options button in the left pane and then select the Secondary Axis radio button.

In Figure 7-21, notice a newly-added axis to the right of the chart. Any data series on the secondary axis has its vertical axis labels shown on the right.

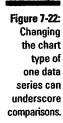
Figure 7-21:
Thanks
to the
secondary
axis, both
trends are
clearly
defined.

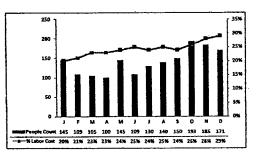


Again, changing the chart type of any one of the data series can help in comparing the two trends. In Figure 7-22, the chart type for the People Count trend has been changed to a column. Now you can easily see that although the number of people has gone down in November and December, the percentage of labor cost continues to rise.



To change the chart type of any data series, right-click the data series and then choose Change Chart Type.





Highlighting Periods of Time

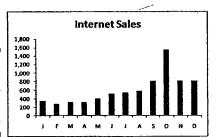
Some of your trending components may contain certain periods where a special event occurred, causing an anomaly in the trending pattern. For instance, you may have an unusually large spike or dip in the trend caused by some occurrence in your organization. Or maybe you need to mix actual data with forecasts in your charting component. In such cases, it could be helpful to highlight specific periods in your trending with special formatting.

Formatting specific periods

Imagine you just created the chart component illustrated in Figure 7-23 and you want to explain the spike in October. You could, of course, use a footnote somewhere, but that would force your audience to look for an explanation elsewhere on your dashboard. Calling attention to an anomaly directly on the chart helps give your audience context without the need to look away from the chart.

A simple solution is to format the data point for October to display in a different color and then add a simple text box that explains the spike.

Figure 7-23: The spike in October warrants highlighting.



To format a single data point:

1. Click the data point once.

This places dots on all the data points in the series.

2. Click the data point again to ensure Excel knows you're formatting only that one data point.

The dots disappear from all but the target data point.

3. Right-click and choose Format Data Point.

This opens the Format Data Point dialog box, as shown in Figure 7-24.

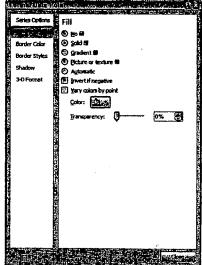


Figure 7-24:
The Format
Data Point
dialog box
gives you
formatting
options for a
single data
point.

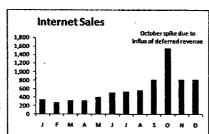
The idea is to adjust the formatting properties of the data point as you see fit.



The dialog box shown in Figure 7-24 is for a column chart. Different chart types have different options in the Format Data Point dialog box. Nevertheless, the idea remains the same in that you can adjust the properties in the Format Data Point dialog box to change the formatting of a single data point.

After changing the fill color of the October data point and adding a text box with some context, the chart nicely explains the spike. (See Figure 7-25.)

Figure 7-25:
The chart
now draws
attention to
the spike in
October and
provides
instant
context via
a text box.



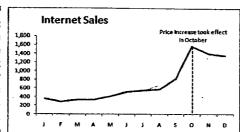


To add a text box to a chart, click the Insert tab in the Ribbon and select the Text Box icon. Then click inside the chart to create an empty text box, which you can fill with your words. Visit Chapter 6 for a detailed refresher on dynamic labeling.

Using dividers to mark significant events

Every now and then a particular event shifts the entire paradigm of your data permanently. A good example is a price increase. The trend shown in Figure 7-26 has permanently been affected by a price increase implemented in October. As you can see, a dividing line (along with some labeling) provides a distinct marker for the price increase, effectively separating the old trend from the new.

Figure 7-26:
Use a simple line to mark particular events along a trend.



Although there are lots of fancy ways to create this effect, I find that I rarely need to get any fancier that manually drawing a line myself. To draw a dividing line inside a chart, take the following steps:

- 1. Click the chart to select it.
- 2. Select the Insert tab on the Ribbon and click the Shapes button.

- Select the line shape, go to your chart, and draw the line where you want it.
- 4. Right-click your newly-drawn line and choose Format Shape.
- Use the Format Shape dialog box to format your line's color, thickness, and style.

Representing forecasts in your trending components

It's common to be asked to show both actual data and forecast as a single trending component. When you do show the two together, you want to ensure that your audience can clearly distinguish where actual data ends and where forecasting begins. To see what I mean, take a look at Figure 7-27.





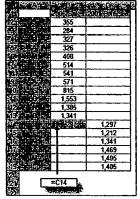
The best way to achieve this effect is to start with a data structure similar to the one shown in Figure 7-28. As you can see, sales and forecasts are in separate columns so that when charted, you get two distinct data series. Also note that the value in cell B14 is actually a formula referencing C14. This value serves to ensure a continuous trend line (with no gaps) when the two data series are charted together.

When you have the appropriately structured dataset, you can create a line chart. At this point, you can apply special formatting to the 2007 Forecast data series. Follow these steps:

1. Click the data series that represents 2007 forecast.

This places dots on all the data points in the series.

Figure 7-28: Start with a table that places your actual data and your forecasts in separate columns.



2. Right-click and choose Format Data Series.

This opens the Format Data Series dialog box.

When the Format Data Series dialog box activates, you can adjust the properties to format the series color, thickness, and style.

Other Trending Techniques

In this section, I show you a few techniques that go beyond the basic concepts I've covered so far.

Avoiding overload with directional trending

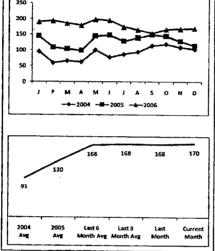
Do you work with a manager that's crazy for data? Are you getting headaches from trying to squeeze three years of monthly data into a single chart? Although it's understandable to want to see a three-year trend, placing too much information on a single chart can make for a convoluted trending component that tells you almost nothing.

When you're faced with the need to display impossible amounts of data, step back and think about the true purpose of the analysis. When your manager asks for a three-year sales trend by month, what's he really looking for? It could be that he's really asking whether current monthly sales are declining versus history. Do you really need to show each and every month or can you show the directional trend?

A directional trend is one that uses simple analysis to imply a relative direction of performance. The key attribute of a directional trend is that the data used is often a set of calculated values as opposed to actual data values. For instance, instead of charting each month's sales for a single year, you could chart the average sales for Q1, Q2, Q3, and Q4. With such a chart, you'd get a directional idea of monthly sales, without the need to look into detailed data.

Take a look at Figure 7-29, which shows two charts. The top chart trends each year's monthly data in a single trending component. You can see how difficult it is to discern much from this chart. It looks like monthly sales are dropping in all three years. The bottom chart shows the same data in a directional trend, showing average sales for key time periods. The trend really jumps at you, showing that sales have flattened out after healthy growth in 2004 and 2005.



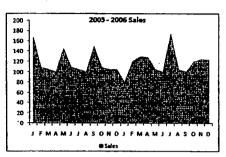


Smoothing data

Certain lines of business lend themselves to wide fluctuations in data from month to month. For instance, a consulting practice may go months without a steady revenue stream before a big contract comes along and spikes the sales figures for a few months. Some call these ups and downs seasonality or business cycles.

Whatever you call them, wild fluctuations in data can prevent you from effectively analyzing and presenting trends. Figure 7-30 demonstrates how highly volatile data can conceal underlying trends.

Figure 7-30: The volatile nature of this data makes it difficult to seek the underlying trend.



This is where the concept of *smoothing* comes in. Smoothing does just what it sounds like — it forces the range between the highest and lowest values in a dataset to smooth to a predictable range without disturbing the proportions of the dataset.

Now, you can use lots of different techniques to smooth a dataset. Take a moment to walk through one of the easier ways to apply smoothing.

Start a new column in the data source for the chart. In Figure 7-31, the new column is appropriately called Smoothing. In the second row of the smoothing column, create a simple average formula that averages the first data point and the second data point. Note that the reference to the first data point (cell D2) is locked as an absolute value with dollar (\$) signs. This ensures that when this formula is copied down, the range grows to include all previous data points.

After you copy the formula down to fill the entire smoothing column, you can plot its data add a new data series to your chart. Figure 7-32 illustrates the smoothed data plotted as a line chart.

Figure 7-31:
The smoothing column feeds a new series to your chart.

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9		109		
3.		105		
92	2.003	100		
10.		150		
40.0	1960	400		

Figure 7-32: Plotting the smoothed data reveals the underlying trend.



Catching sparkline fever

Sparklines, developed by visualization guru Edward Tufte, are mini word-sized charts placed in and among textual data, allowing you to see trends and patterns at a glance with minimal space. With the sparkline concept, Tufte provides a mechanism that allows you to get visual context for data without the need to take up a lot of real estate on your dashboards.

Figure 7-33 illustrates how trending sparklines help provide an additional layer of context to the month-over-month analysis provided. You can see that the month-over-month variance for the year 2006 is 8 percent. Without the sparkline, this variance would seem like cause for celebration. However, the 12-month trend provided by the sparkline allows you to quickly see that the data has been in a long, slow decline for some time.

Figure 7-33: Sparklines allow you to see trends and patterns at a glance with minimal space.

2005 179 186 4% -~	Trend	12 Mo	Variance	This Month	Last Month]
laasa	~~		4%	186	179	2005
2006 130 141 8%	~		8%	141	130	2006

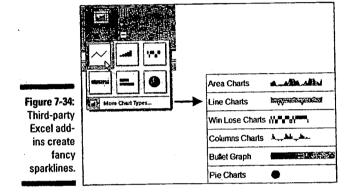
In terms of Excel, a sparkline is simply a miniature chart. The steps in creating a sparkline natively in Excel are relatively simple. Just follow these steps:

- 1. Create a normal-sized chart that displays the trending you need to see.
- Remove anything from the chart that isn't part of the data series: gridlines, labels, axes, titles, and so on.

- 3. Under the Format tab, find and adjust the height and width selectors under the Size group to resize the chart so that the height is about .50 inches wide and .25 inches tall.
- 4. Click and drag the chart where you want it displayed.

If you really want to get fancy with sparklines, you may want to explore any one of the Excel add-in applications that specialize in creating sparklines. My favorite sparkline add-in is MicroCharts from BonaVista Systems. The MicroCharts add-in integrates directly into the Excel Ribbon and offers plenty of sparklines that are both effective and attractive. (See Figure 7-34.)

With MicroCharts, you can point to your data and then sparklines are placed where you specify. No need to create and maintain separate charts. When you have a data model prepared, creating a dashboard, like the one shown in Figure 7-35, becomes a matter of pointing the MicroCharts add-in to the data.



TITE D. LL.

Last 12 Months	1 System		Ava	Mability %
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	Network			98.5%
AND DESK	ERP			97.99
per plant and	Data Warehouse	-		93.29
and harmon	Web Site	-		98.59
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CPU tast	L. E. Hills	Overalt		96.77
Storage Last	al arti lete	Today		94.75

Figure 7-35: A dashboard created with the MicroCharts sparkline add-in.

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Part III: Building Advanced Dashboard Components



To take a test drive of the MicroCharts add-in, download the free trial from www.bonavistasystems.com/DownloadMicroCharts.html.

Chapter 8

Components That Group and **Bucket Data**

In This Chapter

- ▶ Making top and bottom displays
- ▶ Using histograms to track groups
- ► Creating histograms with pivot tables
- ▶ Highlighting top and bottom values in charts

It's often helpful to organize your analyses into logical groups of data. Grouping allows you to focus on manageable sets that have key attributes. For example, instead of looking at all customers in one giant view, you can analyze customers who buy only one product. This allows you to focus attention and resources on those customers who have the potential of buying more products.

The benefit of grouping data is that it allows you to more easily pick out groups that fall outside the norm for your business.

In this chapter, I explore some of the techniques you can use to create components that group and bucket data.

Creating Top and Bottom Displays

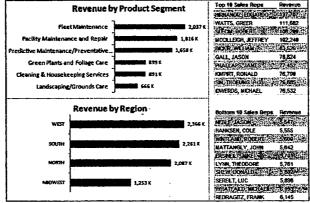
When I look at the list of Fortune 500 companies, I immediately look to see the top 20 companies. Then I look to see who just eked in at the bottom 20. I rarely check to see who's number 251. It's not because I don't care about number 251; it's just that I don't have the time or energy to process all 500 companies. So I process the top and bottom of the list.

This is the same concept behind creating top and bottom displays. Your audience has only a certain amount of time and resources to dedicate to solving any issues you can highlight in your reporting mechanism. Showing them the top and bottom values in a dataset can help them pinpoint where and how they can have the most impact with the time and resources they do have.

Incorporating top and bottom displays into dashboards

The top and bottom displays you create can be as simple as tables you incorporate into your dashboards. These tables are typically placed to the right of a dashboard to highlight some detailed data a manager can use to take action on a metric. For example, the simple dashboard shown in Figure 8-1 shows sales information with top and bottom Sales Reps.





To get a little fancier, you can supplement your top and bottom displays with some ranking information, some in-cell bar charts, or some conditional formatting. (See Figure 8-2.)

You can create the in-cell bar charts with the REPT function, which I cover in Chapter 6. The arrows are simple conditional formatting rules that are evaluated against the variance in current and last months' ranks.

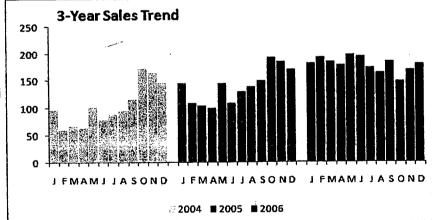
This gallery shows you some of the components you will find within the black and white pages of this book. Here you'll see them in full **Technicalest** Ooooh! I've also included a few sample dashboards you may be able to use as inspiration for your next project. Enjoy!

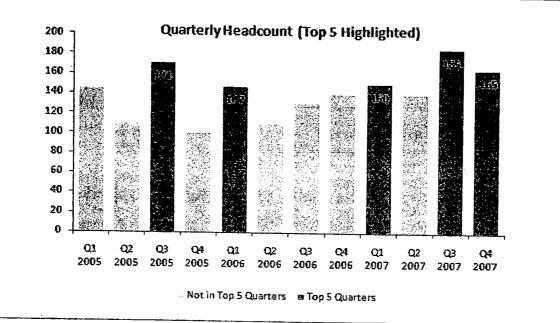
•				VS:	Last
Top 10 Sales Reps	Sales	Rank	Last Month	M	onth
HIRNANDIZ, EDUARDO	\$137,707	1	1	➾	0
WATTS, GREER	\$111,682	2	3	1	1
SLECIM, ROBERT	\$106,299	3	5	Ť	2
MCCILLEIGH, JEFFREY	\$102,240	4	2	4	-2
BICKIR, WILLIAM	\$83,526	5	3	\$	-2
GALL, JASON	\$78,824	6	12	1	6
PHALLAPS, JAMES	\$77,452	7	7	➾	0
KIMPIRT, RONALD	\$76,790	8	9	1	1
SIN, THOEUNG	\$76,685	9	8	\Rightarrow	-1
IDWERDS, MICHAEL	\$76,532	10	4	4	-6

					VS	Last
Bottom 10 Sales Reps		Sales	Rank	Last Month	M	onth
NEBLE, JASON	\$5,547		244	244	➾	0
CELIMAN, WILLIAM	\$9,779		243	241	4	-2
KRIZILL, ADAM	\$11,454		242	235	#	-7
MIDANA, FRANK	\$15,044		241	221	1	-20
GRANGIR, DAVID	\$16,129		240	240	➾	0
DALLEARE, ANDRE	\$16,265		239	239	⇨	0
HICKLIBIRRY, JERRY	\$16,670		238	225	\$	-13
VAN HUILE, KENNETH	\$18,821		237	242	1	5
RACHERDSEN, KENNETH	\$19,675		236	237	1	1
STIGALL, DAVID	\$20,092		235	243	1	8

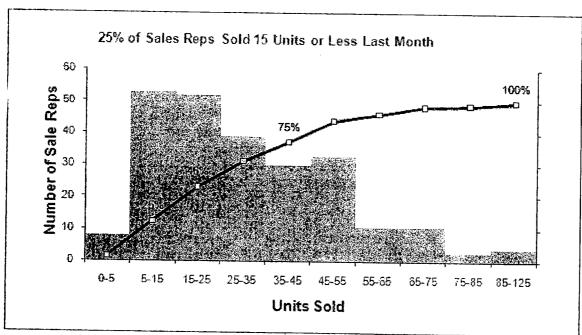
In Chapter 8, I talk about the benefits of including top and bottom views in your dashboard. This figure shows how you can supplement your top and bottom displays with some ranking information, some in-cell bar charts, and conditional formatting. These kinds of tables are typically placed to the right of a dashboard to highlight detailed data for top and bottom groups.

This technique, pulled from Chapter 7, shows how it can be far more effective to chart trend data side-by-side as opposed to jamming three lines on top of each other. Yes, this is all one chart!

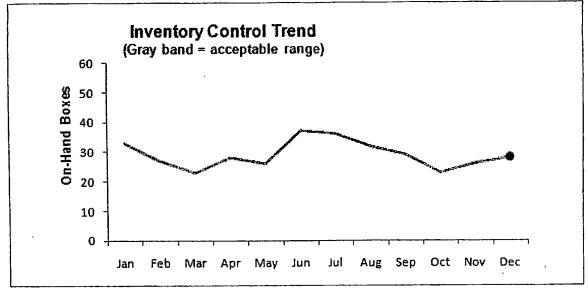




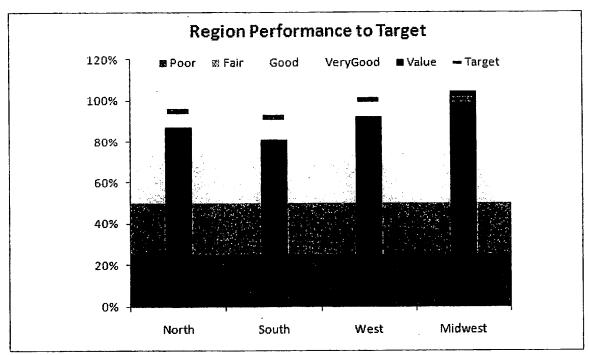
This chart purposely highlights the top five quarters based on headcount. No, the formatting and labeling was not done by hand. Excel actually calculates which quarters are in the top five and formats them automatically. You can find out how in Chapter 8.



Histograms are awesome grouping components, helping you see the general distribution of a particular category or event. In Chapter 8, I show you how to create histograms from a pivot table!



In some situations, you'll need to track performance against a target range instead of against a single target value. In this chart, monthly on-hand inventory is compared to an acceptable range. The cool thing about this component is that the target range can be adjusted by simply editing two cells. Check out Chapter 9 to see how this works.



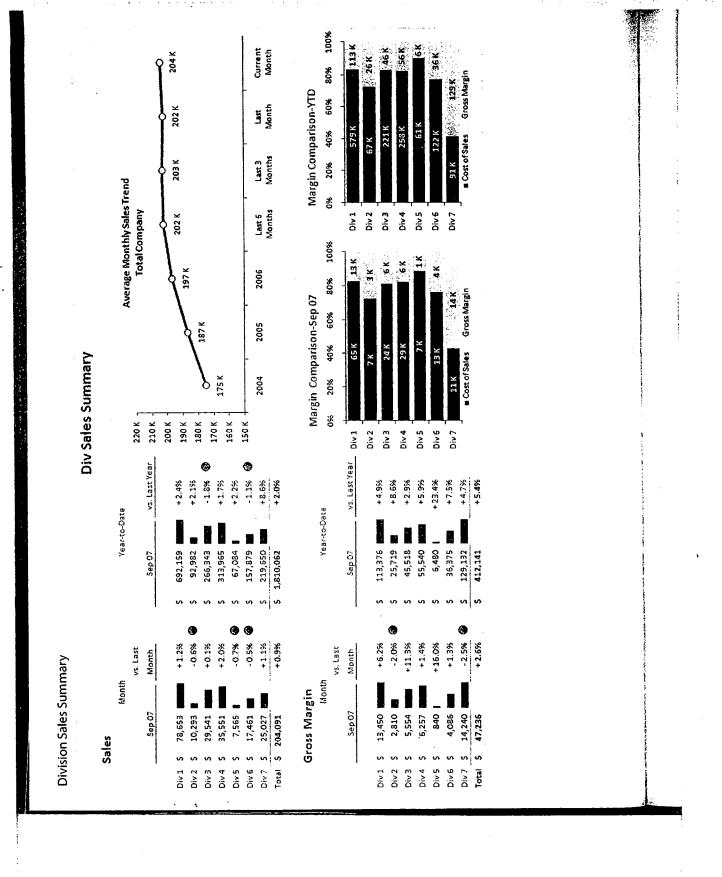
In Chapter 9, I introduce you to the amazing bullet graph. A bullet graph is a type of column/bar graph developed by visualization expert Stephen Few to display multiple perspectives in an incredibly compact space.

Largest Annual Attendance Increases 1979 to Largest Annual % Increase 1979 to 2006 251% 238% 2006 (millions) +2.6 + 2.0 + 1.9 + 2.9 +1.4 Katmai NP & PRES All Others All Others Canyonlands NP Channel islands NP **Dry Tortugas NP** Biscayne NP Saguaro NP Cuyahoga Valley NP Glacier Bay NP & PRES Arches NP Great Basin NP Great Smoky Mtns Hawaii Volcanoes Bryce Canyon Saguaro Grand Canyon Yellowstone Cuyahoga Valley Zion Yosemite Olympic 300 PP - Hawaii Volcanoes NP %0+ **★** Total Annual vs. Avg. 1979 - 2,266 2006 - 3,342 % Change, 1979 to 2006 +1% %0, - 12% +47% + 40% National Park Annual Attendance (thousands) - Big Bend NP 1979- 341 2006- 301 Average, all National Parks 2 Hawaii Volcanoes NP Hawaii Volcanoes NP Big Bend NP Big Bend NP 100,000 10,000 1,000 100 9

Interactive National Park Attendance Comparison Report

Select 2 parks to compare:

Interactive National Park Comparison Report



Legend X <10% Margin | Cancellations & Delays - Worst 10 Routes (last 3 months) Delays % 31.4% 14.3% 26.3% 29.7% 21.7% 25.6% 15.8% 19.7% 14.9% 16.7% 9.8% Cancelation % Cancellations - Causes (last 30 days) 0.9% 5.1% 1.9% 1.1% 0.3% w.98 2.8% Delays - Causes (last 30 days) Gate Handling Other Missing/Late Ground Crew Missing/Late Flight Crew Mechanical Missing/Late Ground Crew Gate Handling Other Westher Missing/Late Flight Crew Mechanical Weather Houston Orlando Detroit Orlando Orlando Orlando Baston Seattle Dallas Denver Total Domestic routes Salt Lake City Winneapolis Memphis Oakland Dallas Houston Chicago Oakland Chicago Detroit Legend 🗶 <20% Margin Margin per Margin per Passenger Passenger 1,380 1,664 1,089 210 391 325 906 618 **X** * # # * * 340 280 175 75 125 33 Passenger Revenue 1,250 1,324 Revenue 2,123 2,560 2,722 1,811 1,765 555 485 ğ 186 245 125 590 555 450 448 202 % Domestic Margin ※ Domestic Margin Margin (000's), Margin (000's), 55% * * * * * * * * * * * * * * * 18. 8 1,230 337 956 (717) 2,346 268 390 141 210 1,856 1,089 626 817 467 ※ Domestic Revenue % Domestic Revenue Revenue (2001), Revenue (000's), 25% % **%** % % % % % % % 12,180 11% Top 10 International Routes by Revenue 22,326 2,042 1,500 5,648 2,504 1,784 1,174 89,092 2,800 2,483 3,609 3,584 6,355 4,674 3,583 2,847 3,602 3,221 Top 10 Domestic Routes by Revenue Airline Route Analysis New York San Francisco New York Philadelphia New York Mexico City New York Washington Total International Routes Detroit Sao Paolo Detroit Frankfurt Atlanta New York New York Adelaids New York Veracruz Chicago New York Columbus (Ohio) New York New York Phoenix New York Toronto Phoenix Sydney Denver Bogota Total Domestic routes New York Detroit New York Seattle New York London Atlanta Lima New York Lima From To From To

Airline Route Analysis

Compact KPI Summary (created using Bonavista's Microcharts® Excel add-in)

Compact KPI Summary

Sparklines and mini-charts created with BonaVista's Microcharts® Excel add-in

Nov 055				Last 3 Mo	Last 12 mo			% of	
## S18,134 ## \$17,985 ## \$17,728 ## \$11,358 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,186 ## \$11,180 ## \$12,600 ## \$12,600 ## \$12,600 ## \$12,600 ## \$12,600 ## \$12,000 ## \$12,000 ## \$12,000 ## \$12,000 ## \$13,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,376 ## \$1,300 ##			Nov 65	Ave	9,4	12 Month Trend	Targets	Target 0% 1	100% 150%
rie		S Revenues	S18,134 K	S17,985 K	S17,728 K		\$18,000 K	101% Petric sacretions (New York)	
S6,776 S6,799 S6,147	Finance	S Expenses	S11,358 K	\$11,186 K	\$11,580 K	{	\$12,600 K	908 STATES OF THE STATES OF TH	
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## 31,206 K 31,376 K 31,516 K			346 K	347 K	349 K	1	395 K	88% recommended and the second	
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Revenue / Mile \$52.34 \$51.82 \$50.80 \$50.00 Fuel Costs / Mile \$3.73 \$3.84 \$3.80 \$3.00 Profit / Pssng. Mile \$0.22 \$0.22 \$0.20 \$0.15 Desiration / Discourse 30.4 20.7 20.4 277	x A	Profit / Mile	\$19.56	\$19.59	\$17.61	5	\$15.00	130% interestrational and a 130% interestration of the 130% interestration	Control Control Control
Fuel Costs / Mile \$3.73 \$3.84 \$3.80 \$3.00 Profit / Pssng. Mile \$0.22 \$0.22 \$0.20 \$0.15	1	Revenue / Mile	\$52.34	\$51.82	\$50.80	-	\$50.00	105% POSTAL CARTESTAND PROPERTY.	
\$0.22 \$0.22 \$0.20 \$0.15	Macitos	Fuel Costs / Mile	\$3.73	53.84	\$3.80	{	\$3.00	1248 Contractions relatives 1248	CONTRACTOR
307		Profit / Pssng. Mile	\$0.22	\$0.22	50.20	5	\$0.15	145% when the construction presentations	Contract presentations
117 A +67 167 +00		Revenue / Passenger	304	297	294	>	277	110% and a consequence of the second	William Street Construction

Figure 8-2:
You can use
the REPT
function
and some
conditional
formatting
to add visual
components
to your top
and bottom
displays.

·			VS Last
Top 19 Sales Rope	Seles .	Rank Lact	
MANUADE EDUADOS	eisteral	Maria Carlo	+××+ 0
WATTS, GREER	3111,682	2	3 🛊 1
SUCCE ROBERT SUR	E-5190-290	124	2005
MCCLLEIGH, JEFFREY	\$142,240	4	2 4 -2
BEXT WILLE		5.7	3
GALL, JASON	578,824	6	12 🛊 6
HALLY LIVES I			760) → 10
KIMPIRT, RONALD	\$76,790	8	9 🛊 1
SN: THOELING	176 636	在 由海 安安安	
DWERDS, MICHAEL	\$76,532	10	4
EWERDS, MICHAEL		10	4 4 -6
DWERDS, MICHAEL Bottom 18 Sales Rope	\$76,532	10 Renk Last	vs Las Month Month
EWERDS, MICHAEL Bottom 18 Sales Reps	Salos	Rank Last	vs Las Month Month
Bottom 18 Sales Reps		Rank Last	vs Las Month Month
Bottors 18 Sales Rope MENT LASON CELMAN, WILLIAM	Salos 30/7/9	Renk Last 244 243 2	vs Last Month Month 44 10 41 25
BOTIONS MICHAEL BOTIONS 18 Sales Rope MENT ASSON CELIAN, WILLAN INDIALS JOAN NEARS, FRANK	Salos 55,277 50,779 31,55,44	Renk Last 244 243 2	Vs Last Month Month 41
Bottors 18 Sales Reps (CFLMAN, WILLIAM) (MICHAEL SALES REPSENDED TO THE SALES REPSE	Sales 39.779 31.654	Rank Last 243 2 243 2 241 2	Vs Last Month Month 44 2 21 20
DWEIDS, MICHAEL Bottom 18 Sales Reps MICHAEL JASHIN CELMAN, WILLAM HIDANA, FRANK DALLEARE, ANDRE	Salne 39,779 315,644 318,265	Rank Last 243 2 243 2 241 2 241 2 241 2	Va Last Month Month 41 2 42 21 20 43 40 43 40 44 40 45 40 46 40 47 40 48
BOTTOM 18 Sales Reps Sent ASSN 3 STATE ASSN	Saltes 55/7/9 51/5/44 51/5/44 51/5/44 51/5/44 51/5/44	Renk Leet 2443 2 243 2 221 2 221 2 229 2	4
CHICATA SALES REPS COLLANA WILLAN SHOULD CHICAGO COLLANA WILLAN SHOULD CHICAGO COLLANA WILLAN COLLANA WILLAN COLLANA WILLAN COLLANA WILLAN COLLANA COLLANA VAN HURE, COLLANTH	Salma 50,779 515,644 510,265 510,265	Renk Lust 243 2 241 2 1 229 2	Worth Month 44 2 21 20 20 30 40 60 60 60 60 60 60 60 60 60 60 60 60 60
CHICATA SALES REPS COLLANA WILLAN SHOULD CHICAGO COLLANA WILLAN SHOULD CHICAGO COLLANA WILLAN COLLANA WILLAN COLLANA WILLAN COLLANA WILLAN COLLANA COLLANA VAN HURE, COLLANTH	Saltes 55/7/9 51/5/44 51/5/44 51/5/44 51/5/44 51/5/44	Rank Last 243 2 243 2 241 2 241 2 241 2 242 2	4

Using pivot tables to create interactive top and bottom views

If you read Chapter 3, you know that a pivot table is an amazing tool that can help create interactive reporting. Take a moment to walk through an example of how pivot tables can help you build interactive top and bottom displays. You can open the Chapter 8 Sample File.xlsx file, found on this book's companion Web site, to follow along. Follow these steps to build a display with a pivot table:

1. Start with a pivot table that shows the data you want to display with your top and bottom views.

In this case, the pivot table shows Sales Rep and Sales_Amount. (See Figure 8-3.)

Figure 8-3: Start with a pivot table that contains the data you want to filter.

The state of the s	
	PARTY TO THE PARTY OF
State of the state	
630	
🚧 Sales Rep	Sales Amount
SEABERRA CHRISTOPHER	\$28,370
ADEMO, DANNEL	\$20,259
ZZ ADEMS, KYLE	\$21,500
DE ADEMS, TAIWAN	\$27,593
9 ALCERO, ROBERT	\$42,697
MANDIRSEN, DORAN	
	\$47,857
ME ASHEM, CHRIS	\$23,283
ATKANS, TERRY	\$24,297
THEALIY, CHRISTOPHER	\$38,132
ALBECHMAN, JOHN	\$20,310
TO BECKMAN, ADRIAN	\$9,236
CONTRACTOR OF THE PARTY	\$12,001

2. Right-click any Sales Rep name in the table, choose Filter, and then choose Top 10, as demonstrated in Figure 8-4.

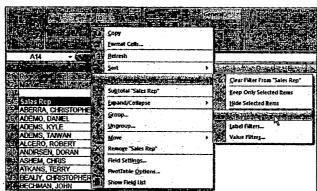
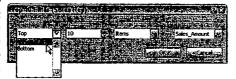


Figure 8-4: Select the Top 10 filter option.

The Top 10 Filter (Sales Rep) dialog box appears. (See Figure 8-5.)

Figure 8-5: Specify the filter you want to apply.



In the Top 10 Filter (Sales Rep) dialog box, define the view you're looking for.

In this example, you want the Top 10 Items (Sales Reps) as defined by the Sales_Amount field.

Note that the drop-down-box in Figure 8-5 contains options for Top and Bottom. You can use the same dialog box to get the bottom ten items.

4. Click OK to apply the filter.

At this point, your pivot table is filtered to show you the top ten sales reps for the selected Region and Market. You can change the Market filter to Charlotte and get the top ten sales reps for Charlotte only. (See Figure 8-6.)

Figure 8-6:
You can interactively filter your pivot table report to instantly show the top ten sales reps for any Region and

Market.

。 11年第1日本語	CHARLOTTE SON MANUAL	7
		_
🖺 Sales Rep	Sales_Amount	ı
MCC&LEIGH, JEFFREY	\$98,09	30
CERDWILL, TIMOTHY	\$54,88	33
EBRADFERD, JAMES	\$49,43	35
LIDIOLIY, CHARLES	\$47,22	20
SWANGIR, ADAM	\$46,60	ΰ8
DISKILTEN, JAMES	\$43,56	5 9
PIORSEN, HEYWARD	\$41,00	οs
ZICRIOMIR, TIMOTHY	\$34,10	69
PERSENS, GREGORY	\$33,0	26
BIOCH, RONALD	\$30,10	68
5 Grand Total	\$478.17	

5. To create the bottom ten Sales Rep list, copy the entire pivot table and paste it next to the existing one.



There's no need to create another pivot table from scratch. You can copy and paste any pivot table to create various views using the same data source. The best part is that when you copy and paste a pivot table, you don't add to your file's memory or file size because you're using the same data cache.

Repeat Steps 2-4 in the newly-copied pivot table except this time choose to filter on the bottom ten items as defined by the Sales_Amount field.

If all went well, you now have two pivot tables similar to Figure 8-7: one that shows the top ten sales reps, and one that shows the bottom ten. You can link back to these two pivot tables using formulas. This way, when the data is refreshed, your top and bottom displays are updated.

Figure 8-7: You now have two pivot tables that show top and bottom displays.

A PLANTAGE OF THE PARTY OF THE	SHE WALL	A STATE OF BUILDING	CONTRACTOR OF
Top Sales Reps		Bottom Sales Reps	
PART OF THE PART O			四世紀
SENSTRUCTURE SERVICE OF	RECORDER	- Calculation of the Calculation	ARDOME
7		200	
🖾 Sales Rep 🔛 Sale	es_Amount		ites Amount
REMCCILLEIGH, JEFFREY	\$98,090	MEERE, RUSSELL	\$6,635
CERDWILL, TIMOTHY	\$54,883	GERRUIS, ROBERT	\$7,786
BRADFERD, JAMES	\$49,435	BECKMAN, ADRIAN	\$9,236
9 DIDLIY, CHARLES	\$47,220	REBIRTS, ADAMS	\$13,237
10 SWANGIR, ADAM	\$46,608	HELT, CHRISTOPHER	\$15,147
ANSKILTEN, JAMES	\$43,569	HERVIY, CHRISTOPHER	\$15,260
12 PIORSEN, HEYWARD	\$41,005	WALLAEMS, SHAUN	\$15,477
13 CRIOMIR, TIMOTHY	\$34,169	CRAVIY, ANTHONY	\$22,761
IN PERSENS, GREGORY	\$33,026	BRAGHT, THOMAS	\$25,005
15 BIOCH, RONALD	\$30,168	MEERE, TERRY	527,149
(6) Grand Total	\$478,172	Grand Total	\$157,693
373			



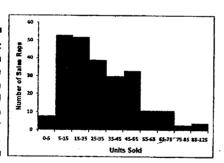
If there's a tie for any rank in the top or bottom values, Excel shows you all the tied records. This means you may get more than the number you filtered for. In other words, if you filtered for the top 10 sales reps and there's a tie for number the number 5 rank, Excel shows you 11 sales reps (both reps ranked at number 5 will be shown).

Using Histograms to Track Relationships and Frequency

A histogram is essentially a graph that plots frequency distribution. What's a frequency distribution, you ask? A frequency distribution shows how often an event or category of data occurs. With a histogram, you can visually see the general distribution of a certain attribute.

To see what I mean, take a look at the histogram shown in Figure 8-8. This histogram represents the distribution of units sold in one month among your sales reps. As you can see, most reps sell somewhere between 5 and 25 units a month. As a manager, you want the hump in the chart to move to the right — more people selling a higher number of units per month. So you set a goal to have a majority of your sales reps sell between 15 and 25 units within the next three months. With this histogram, you can visually track the progress toward that goal.

Figure 8-8:
A histogram showing the distribution of units sold per month among your sales force.



Before you get started creating your first histogram, it's important to note the several ways to do this in Excel. In this chapter, I show you how to create a histogram using formulas and pivot tables. The techniques I cover here fit nicely in reporting data models where there is a separation of data, analysis, and presentation. In addition, these techniques allow for a level of automation and interactivity that come in handy when refreshing reports each month.

Creating formula-driven histograms

First, you need a table that contains your raw data. The raw data should ideally consist of records that represent unique counts for the data you want to group. For instance, the raw data table in Figure 8-9 contains unique sales reps and the number of units each has sold. Follow these steps to create a formula-driven histogram:

1. Before you create your histogram, you need to create a Bin table.

The Bin table dictates the grouping parameters that are used to break your raw dataset into the frequency groups. The Bin table in Figure 8-9 tells Excel to cluster all sales reps selling less than 5 units into the first frequency group, any sales reps selling 5 to 14 units in the second frequency group, and so on.

Figure 8-9: Start with your raw data table and a Bin table.

	Barry Barry	SHI CARLES TO SHIP TO SHIP
Sales Rep	Units Sold	
ZUERSINEILT, MIKE	5	
MHANKSEN, COLE	5	0
LYNN, THEODORE	5	5
MATTANGLY, JOHN	5	15
NEBLE, JASON	. 5	25 35
ASSERBILT, LUC	5	35
85 SHEW, DONALD	5	45
9 WINTLAND, ROBERT	5	55
DEBLANCHIT, DANNY	6	65 75
BLEKE JR, SAMUEL	6	75
Z ETEVAC, ROBERT	- 6	85
KNER, ANTHONY	6	125
MEERE, RUSSELL	6	
COUNTABO CEAN	c.	



You can freely set your own grouping parameters when you build your Bin table. However, it's generally a good idea to keep your parameters as equally spaced as possible. I typically end my Bin tables with the largest number in my dataset. This allows me to have clean groupings that end in a finite number — not in an open-ended greater than designation.

2. After your raw data and Bin tables are ready, you must create a new column that holds the FREQUENCY formulas. Name the new column Frequency Formulas as seen in Figure 8-10.

Excel's FREQUENCY function counts how often values occur within the ranges you specify in a Bin table.

- 3. Highlight a number of cells equal to the cells in your Bin table.
- 4. Type the FREQUENCY formula you see in Figure 8-10 and then press Ctrl+Shift+Enter on your keyboard.



The FREQUENCY function does have a quirk that often confuses first-time users. The FREQUENCY function is an array formula — that is, it's a formula that returns many values at one time. In order for this formula to work properly, you have to press Ctrl+Shift+Enter on your keyboard after typing the formula. If you simply hit the Enter key, you won't get the results you need.

Figure 8-10: Enter the FREQUENCY formula you see here.

SLE SHEET WAS A SAR OF	7 4 8 8	CAN DESCRIPTION OF THE PERSON
ূৰি Sales Rep	Units Sold	
ZERSINEILT, MIKE	5	Bins treated vicomus visit in the
HANKSEN, COLE	5	0 =FREQUENCY(B2:B245,D3:D13)
ELYNN, THEODORE	5	5
MATTANGLY, JOHN	5	15
AND NEBLE, JASON	5	25 经金融资金的增生的保护的
SEREAT, LUC	5	35 外的现在分词形式的现在分词
SHEW, DONALD	5	45 《新菜种种种类》:"从文学的社会工作的
WINTLAND, ROBERT	5	55
BLANCHIT, DANNY	- 6	65
AMBLEKE JR, SAMUEL	- 6	75 22 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
ETEVAC, ROBERT	6	85 战机器 经股份 医皮肤
ENGRE ANTHONY	6	125
AND DESCRIPTION OF THE PROPERTY OF THE PROPERT		

At this point, you should have a table that shows the number of sales reps that fall into each of your Bins. You could chart this table, but the data labels would come out wonky. For the best results, build a simple chart feeder table that creates appropriate labels for each Bin. You do this in the next step.

5. Create a new table that feeds the charts a bit more cleanly (see Figure 8-11).

Use a simple formula that concatenates Bins into appropriate labels. Use another formula to bring in the results of your FREQUENCY calculations.

In Figure 8-11, I made the formulas in the first record of the chart feeder table visible. These formulas are essentially copied down to create a table appropriate for charting.

Figure 8-11:
Build a simple chart feeder table that creates appropriate labels for each Bin.

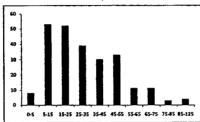
				ALC: U.S.
	Freq	uency Formulas	Chart Feeder	
25	Eat	FER TO THE WHOLES	STATE STATE OF	Countries and Report
	0	0	=D3& "-" &D4	=E4
	5	8	5-15	53
52	15	53	15-25	52
12	25	52	25-35	39
7.4	35	39	35-45	30
82	45	30	45-55	33
972	15 25 35 45 55 65 75 85	33	55-65	. 11
00	65	11	65-75	11
	75	11	75-85	3
32	85	3	85-125	4
13	125	4		

6. Use your newly-created chart feeder table to plot the data into a column chart.

Figure 8-12 illustrates the resulting chart.



Figure 8-12: Plot your histogram data into a column chart.



You can very well use the initial column chart as your histogram. If you like your histograms to have spaces between the data points, you're done.

If you like the continuous blocked look you get with no gaps between the data points, follow the next few steps.

7. Right-click any of the columns in the chart and choose Format Data Series.

The Format Data Series dialog box appears.

8. In the dialog box, select the Series Options button and adjust the Gap Width property to 0%. (See Figure 8-13.)

Adding a cumulative percent to your histogram

A nice feature to add to your histograms is a cumulative percent series. With a cumulative percent series, you can show the percent distribution of the data points to the left of the point of interest.

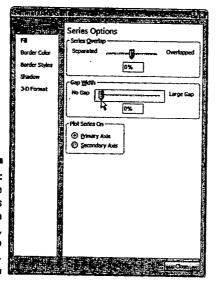


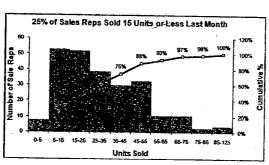
Figure 8-13: To eliminate the spaces between columns, set the Gap Width to 0%.

Figure 8-14 shows an example of a cumulative percent series. At each data point in the histogram, the cumulative percent series tells you the percent of the population that fills all the Bins up to that point. For instance, you can see that 25% of the sales reps represented sold 15 units or less. In other words, 75% of the sales reps sold more than 15 units.

Take another look at the chart in Figure 8-14 and find the point where you see 75% on the cumulative series. At 75%, look at the label for that Bin range (you see 35–45). The 75% mark tells you that 75% of sales reps sold between 0 and 45 units. This means that only 25% of sales reps sold more than 45 units.

Figure 8-14:

The cumulative percent series shows the percent of the population that fills all the Bins up to each point in the histogram.



To create a cumulative percent series for your histogram, follow these steps:

1. After you perform Steps 1 through 5 of creating a histogram (which I outline in the earlier section, "Creating formula-driven histograms"), add a column to your chart feeder table that calculates the percent of total sales reps for the first Bin (See Figure 8-15).

Note the dollar symbols (\$) used in the formula to lock the references while you copy the formula down.

- 2. Copy the formula down for all the Bins in the table.
- 3. Use the chart feeder table to plot the data into a line chart.

As you can see in Figure 8-16, the resulting chart needs some additional formatting.

Figure 8-15: In a new column, create a formula that calculates the percent of total sales reps for the first Bin.

Chart Feeder		
的复数电影	Count of Sales Report	Consulation SC 100 A 100 A 100 A
0-5	. 8	≈SUM(\$H\$3:H3)/SUM(\$H\$3:\$H\$
5-15	53	
15-25	52	
26-35	39	
35-45	30	
45-55	33	
55-65	11	
65-75	11	
75-85	3	
85-125	4	

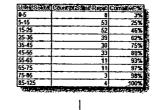
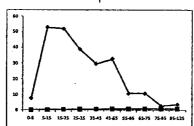


Figure 8-16: Just a little formatting fixes this chart.



- 4. Right-click the series that makes up your histogram (Count of Sales Rep), select Change Chart Type, and then change the chart type to a column chart.
- 5. Right-click any of the columns in the chart and choose Format Data Series.
- 6. Select the Series Options button and adjust the Gap Width property to 0%, as illustrated in Figure 8-13.
- 7. Right-click Cumulative Percent series and choose Format Data Series.
- 8. In the Format Data Series dialog box, select the Series Options button. Change the Plot Series On option to Secondary Axis.
- 9. Right-click Cumulative Percent series and choose Add Data Labels.

At this point, your base chart is complete. It should look similar to the one shown at the beginning of this section in Figure 8-14. When you get to this point, you can adjust the colors, labels, and other formatting.

Creating a histogram with a pivot table

Did you know you can use a pivot table as the source for a histogram? That's right. With a little-known trick, you can create a histogram that is as interactive as a pivot chart!

As in the formula-driven histogram, the first step in creating a histogram with a pivot table is to create a frequency distribution. Here's how you do it:

1. Create a pivot table and plot the data values in the row area (not the data area).

As you can see in Figure 8-17, the SumOfSales Amount field is placed in the row area. Place the Sales Rep field in the data area as a Count.

Figure 8-17: Place your data values in the row area and the Sales Rep field in the data area as a Count.

		Jan (All) M	
	WANTED		
	SumOfSales	Count of	The state of the s
	Amount 🔄	Salas Pon	V Region
5 5	\$5,502,48	1	Market
	\$5,504.14	1	SV Sales Rep
17	\$5,506.13	1	MIT Here Date
483	\$5,518.49	1	Dusiness Segment
193	\$5,521.70	1	Product Description
10	\$5,529.18	1	SumOfSales Amount
33	\$5,534.25	2	
133	\$5,543.33	. 1	
13	\$5,547.04	1	
EQ.	\$5,554,74	11	
	\$5,558.18	1	A CONTRACTOR OF THE PARTY OF TH
1994	\$5,566.79		
器	\$5,586.85 \$5,660.05		
鼢	\$5,625,18		
5 61	\$5,636.53		Supplicates Anount To Count of Sales Rep
Per	77,0.55		13 [8

2. Right-click any value in the row area and choose Group.

The Grouping dialog box appears. (See Figure 8-18.)

Figure 8-18: The Grouping dialog box.

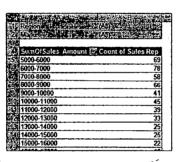


3. In the dialog box, set the start and end values and then set the intervals.

This essentially creates your frequency distribution. In Figure 8-19, the distribution is set to start at 5,000 and to create groups in increments of 1,000 until it ends at 100,000.

After you click OK, the pivot table calculates the number of sales reps for each defined increment, just as in a frequency distribution. (See Figure 8-19.) You can now leverage this result to create a histogram!

Figure 8-19:
The resulting of grouping the values in the Row area is a frequency distribution that can be charted into a histogram.



The obvious benefit to this technique is that after you have a frequency distribution and a histogram, you can interactively filter the data based on other dimensions, like Region and Market. For instance, you can see the histogram for the Canada market and then quickly switch to see the histogram for the California market.



As far as your humble author can tell, you can't add cumulative percentages to a histogram based on a pivot table.

Highlighting Top Values in Charts

Sometimes a chart is indeed the best way to display a set of data, but you still would like to call attention to the top values in that chart. In these cases, you can use a technique that *actually* highlights the top values in your charts. That is to say, you can use Excel to figure out which values in your data series are in the top *n*th value and then apply special formatting to them. Figure 8-20 illustrates an example where the top five quarters are highlighted and given a label.

The secret to this technique lies in Excel's obscure LARGE function. The LARGE function returns the *n*th largest number from a dataset. In other words, you tell it where to look and the number rank you want.

To find the largest number in the dataset, you'd enter the formula LARGE (Data_Range, 1). To find the fifth largest number in the dataset, you'd use LARGE (Data_Range, 5). Figure 8-21 illustrates how the LARGE function works.

Figure 8-20:
This chart
highlights
the top five
quarters
with
different
font and
labeling.

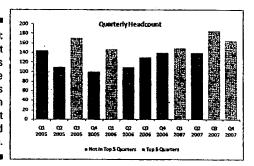
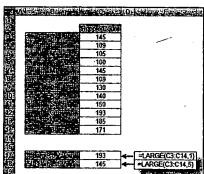


Figure 8-21:
Using the
LARGE
function
returns the
nth largest
number
from a
dataset



The idea is fairly simple. In order to identify the top five values in a dataset, you first need to identify the fifth largest number (LARGE function to the rescue) and then test each value in the dataset to see if it's bigger than the fifth largest number. Here's what you do:

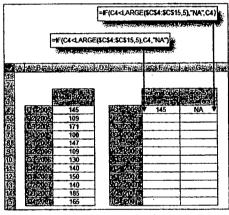
1. Build a chart feeder that consists of formulas that link back to your raw data.

The feeder should have two columns: one to hold data that isn't in the top five, and one to hold data that is in the top five. (See Figure 8-22.)

2. In the first row of the chart feeder, enter the formulas shown in Figure 8-22.

The formula for the first column (F4) checks to see if the value in cell C4 is less than the number returned by the LARGE formula (the fifth largest value). If it is, the value in Cell C4 is returned. Otherwise, NA is used. The formula for the second column works in the same way except the IF statement is reversed: If the value in cell C4 is less than the number returned by the LARGE formula, NA is used; otherwise the value is returned.

Figure 8-22:
Build a new chart feeder that consists of formulas that plots values into one of two columns.



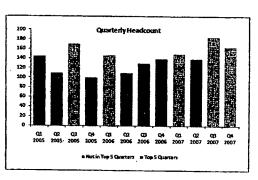
- 3. Copy the formulas down to fill the table.
- 4. Use the chart feeder table to plot the data into a stacked column chart.

You immediately see a chart that displays two data series: one for data points not in the top five, and one for data points in the top five. (See Figure 8-23.)

5. Right-click the top five data series and choose Add Data Label.

Notice in Figure 8-23 that the chart shows some rogue zeros. You can fix the chart so that the zeros don't display by performing the next few steps.

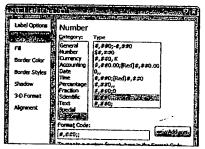
Figure 8-23:
After adding data labels to the top five data series and doing a bit of formatting, your chart should look similar to the one shown here.



- 6. Right-click any of the data labels for the top five series and choose Format Data Labels.
- 7. In the Format Data Labels dialog box, select the Numbers button and select Custom in the Category list.
- 8. Enter #, ##0;; as the custom number format, as demonstrated in Figure 8-24.

Figure 8-24:

Entering #,##0;; as the custom format for a data label renders all zeros in that data series hidden.



9. Click the Add button and then click Close.

When you go back to your chart, you see that the rogue zeros are now hidden and your chart is ready for colors, labels, and other formatting you want to apply.

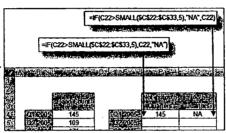
You can apply the same technique to highlight the bottom five values in your data set. The only difference is that instead of using the LARGE function, you

use the SMALL function. Whereas the LARGE function returns the largest nth value from a range, the SMALL function returns the smallest nth value.

Figure 8-25 illustrates the formulas you'd use to apply the same technique outlined here for the bottom five values.

The formula for the first column (F4) checks to see if the value in cell C4 is greater than the number returned by the SMALL formula (the fifth smallest value). If it is, the value in Cell C4 is returned. Otherwise, NA is used. The formula for the second column works in the same way except the IF statement is reversed: If the value in cell C4 is greater than the number returned by the SMALL formula, NA is used; otherwise the value is returned.

Figure 8-25:
Use the SMALL function to highlight the bottom values in a chart.



Chapter 9

Components That Display Performance against a Target

In This Chapter

- Using variance displays
- ▶ Using progress bars
- ▶ Creating bullet graphs
- Showing performance against a range

opefully, this is an easy one to grasp. Someone sets a target, and someone else tries to reach that target. The target could be anything from a certain amount of revenue to a number of boxes shipped or to phone calls made. The business world is full of targets and goals. Your job is to find effective ways to represent performance against those targets.

What do I mean by "performance against a target"? Imagine your goal is to break the land speed record, which is currently 763 miles per hour. That makes your target 764 miles per hour, which will break the record. After you jump into your car and go as fast as you can, you will have a final speed of some number. That number is your performance against the target.

In this chapter, I explore some new and interesting ways to create components that show performance against a target.

Showing Performance with Variances

The standard way of displaying performance against a target is to plot the target and then plot the performance. This is usually done with a line chart or a combination chart, such as the one shown in Figure 9-1.

Figure 9-1:
A typical chart showing performance against a target.



Although this chart allows you to visually pick the points where performance exceeded or fell below targets, it gives you a rather one-dimensional view and provides minimal information. Even if this chart offered labels that showed the actual percent of revenue versus target, you'd still get only a mildly informative view.

I've always thought that a more impactful and informative way of displaying performance against a goal is to plot the variances between the target and the performance. Figure 9-2 shows the same performance data you see in Figure 9-1, but includes the variances (sales revenue minus target). This way, you not only see where performance exceeded or fell below targets, but you get an extra layer of information showing the dollar impact of each rise and fall.

Figure 9-2: Consider using variances to plot performance versus target.

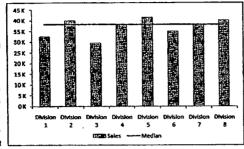


Showing Performance against Organizational Trends

The target you use to measure performance doesn't necessarily have to be one that is specifically set by management or organizational policy. In fact, some of the things you measure may never have a target or goal set for them. In situations where you don't have a target to measure against, it's often helpful to measure performance against some organizational statistic.

For example, the component in Figure 9-3 measures the sales performance for each division against the median sales for all the divisions. You can see that divisions 1, 3, and 6 fall well below the median for the group.

Figure 9-3: Measuring data when there's no target for a measure.



Here's how you'd create a median line similar to the one you see in Figure 9-3:

1. Start a new column next to your data and enter a simple MEDIAN formula, as shown in Figure 9-4.

Note that this formula can be any mathematical or statistical operation that works with the data you are representing. Just ensure that the values returned are the same for the entire column. This gives you a straight line.

2. Copy the formula down to fill the table.

Again, all the numbers in the newly-created column should be the same.

- 3. Plot the table into a column chart.
- 4. Right-click the Median data series and choose Change Chart Type.
- 5. Change the chart type to a line chart.

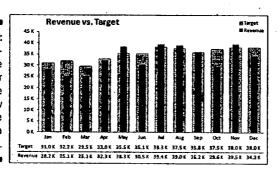
32,526 =MEDIAN(SB\$2.\$B\$9)
2 39,939
2 31, 29,542
3 33,312
5 34,595
3 35,089

Figure 9-4: Start a new column and enter a formula.

Using Thermometer-Style Charts to Display Performance

A thermometer-style chart offers a unique way to view performance against a goal. As the name implies, the data points shown in this type of chart resemble a thermometer. Each performance value and its corresponding target are stacked on top of one another, giving an appearance similar to that of mercury rising in a thermometer. In Figure 9-5, you see an example of a thermometer-style chart.

Figure 9-5: Thermometer-style charts offer a unique way to show performance against a goal.



To create this type of chart, follow these steps:

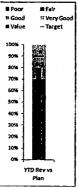
- Starting with a table that contains revenue and target data, plot the data into a new column chart.
- Right-click the Revenue data series and choose Format Data Series.The Format Data Series dialog box appears.
- In the dialog box, select the Series Options button and click Secondary Axis.
- 4. Go back to your chart and delete the new axis that was added; it's the vertical axis to the right of the chart.
- Right-click the Target series and choose Format Data Series.The Format Data Series dialog box appears again.
- 6. In the dialog box, select the Series Options button and adjust the Gap Width property so that the Target series is slightly wider than the Revenue series between 45% and 55% is typically fine.

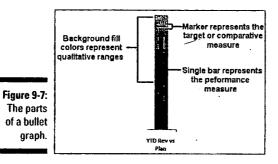
An Introduction to the Bullet Graph

A bullet graph is a type of column/bar graph developed by visualization expert Stephen Few to serve as a replacement for dashboard gauges and meters. He developed bullet graphs to allow for the clear display of multiple layers of information without occupying a lot of space on a dashboard. A bullet graph, as illustrated in Figure 9-6, contains a single performance measure (such as YTD [year-to-date] revenue), compares that measure to a target, and displays it in the context of qualitative ranges, such as Poor, Fair, Good, and Very Good.

Figure 9-7 breaks down the three main parts of a builet graph. The *performance bar* represents the performance measure. The *target marker* represents the comparative measure. And the *background fills* represent the qualitative range.







Creating your first bullet graph

Creating a bullet graph in Excel isn't necessarily difficult, but it can be a bit tricky. Don't let "tricky" scare you, though. Follow these steps to create your first bullet graph:

1. Start with a data table that gives you all the data points you need to create the three main parts of the builet graph.

Figure 9-8 illustrates what that data table looks like. The first four values in the data set (Poor, Fair, Good, and Very Good) make up the qualitative range. You don't have to have four values — you can have as many or as few as you need. In this scenario, I want my qualitative range to span from 0 to 100%. Therefore, the percentages (75%, 15%, 10%, and 5%) must add up to 100%. Again, this can be adjusted to suit your needs.

The fifth value in Figure 9-8 (Value) creates the performance bar. The sixth value (Target) makes the target marker.

- 2. Highlight the entire table and plot the data on a stacked column chart.

 The chart that's created is initially plotted in the wrong direction.
- 3. To fix this, click the chart and select the Switch Row/Column button, as shown in Figure 9-9.
- 4. Right-click the Target series and choose Change Chart Type. Change the chart type to a line chart (with markers).
- Right-click the Target series again and choose Format Data Series.The Format Data Series dialog box appears.
- In the dialog box, click the Series Options button and click Secondary Axis.
- 7. Still in the Format Data Series dialog box, click the Marker Options button and adjust the marker to look like a dash, as demonstrated in Figure 9-10.
- Still in the Format Data Series dialog box, click the Marker Fill button and select the Solid Fill property to set the color of the marker to black.
- 9. Still in the Format Data Series dialog box, click the Line Color button and select the No Line option.

Figure 9-8: Start with a dataset that contains the data points for the main parts of the bullet graph.

A TOTAL AND A	Total Control
20	YTD Rev vs Ptar
2 Poor	70%
Fair	15%
Good	10%
Very Goo	5%
62 Value	80%
77 Target	90%

Figure 9-9: Switch the orientation of the chart to read from columns.

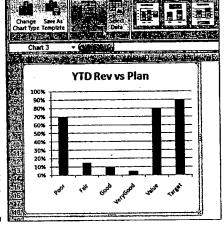
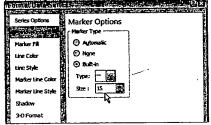


Figure 9-10: Adjust the marker to a dash.



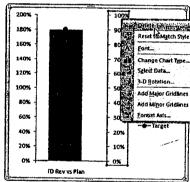
10. Go back to your chart and delete the new secondary axis that was added to the right of your chart. (See Figure 9-11.)

This is an important step to ensure that the scale of the chart is correct for all data points.

- 11. Right-click the Value series and choose Format Data Series.
 The Format Data Series dialog box appears again.
- 12. In the Format Data Series dialog box, click the Series Options button and click Secondary Axis.
- 13. Still in the Format Data Series dialog box under Series Options, adjust the Gap Width property so that the Value series is slightly narrower than the other columns in the chart between 205% and 225% is typically okay.
- 14. Still in the Format Data Series dialog box, click the Fill button and select the Solid Fill property to set the color of the Value series to black.
- 15. You're almost done! All that's left to do is change the color for each qualitative range to incrementally lighter hues.

At this point, your bullet graph is essentially done! You can apply whatever minor formatting adjustments to size and shape of the chart to make it look the way you want.

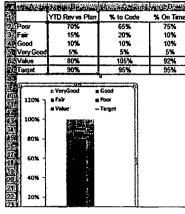
Figure 9-11:
Be sure to
delete the
newlycreated
secondary
vertical axis.



Adding data to your bullet graph

Now, here's the cool part. After you've built your chart for the first performance measure, you can simply use the same chart for any additional measures. Take a look at Figure 9-12 to see what I mean.

Figure 9-12:
You can
easily add
more data to
your chart
by manually
expanding
the chart's
data source
range.



As you can see in Figure 9-12, you've already created this bullet graph with the first performance measure. Imagine you add two more measures and you want to graph those. Here's the easy way to do it:

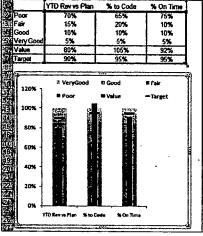
- 1. Click the chart so that the blue outline appears around the original data set.
- 2. Hover your mouse over the blue dot in the lower-right corner of the blue box.

Your cursor turns into a diagonal double arrow, as demonstrated in Figure 9-12.

Click and drag the blue dot to the last column in your expanded data set.

Figure 9-13 illustrates how the new data points are added without one ounce of extra work!





Final thoughts on formatting bullet graphs

Before wrapping up this introduction to bullet graphs, I want to cover two final thoughts I have on formatting:

Creating qualitative bands

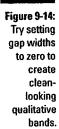
Creating horizontal bullet graphs

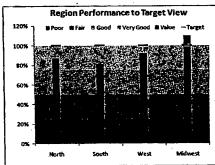
These are discussed in the next two sections.

Creating qualitative bands

First, if the qualitative ranges are the same for all the performance measures in your bullet graphs, you can format the qualitative range series to have no gaps between them. For instance, Figure 9-14 shows a set of bullet graphs where the qualitative ranges have been set to 0 Gap Width. This creates the clever effect of qualitative bands.

- 1. Right-click any one of the qualitative series and choose Format Data Series.
 - The Format Data Series dialog box appears.
- In the dialog box, select Series Options and adjust the Gap Width property to 0%.





Creating horizontal bullet graphs

For those of you who are waiting on the section about horizontal bullet graphs, I have good and bad news. The bad news is that creating a horizontal bullet graph from scratch in Excel is a much more complex endeavor than creating a vertical bullet graph — one that doesn't warrant the time and effort it takes to create them.

The good news is that your clever author has come up with a way get a horizontal bullet graph from a vertical one — and in three steps, no less. Here's how you do it:

- 1. Create a vertical bullet graph.
 - See the section, "An Introduction to the Bullet Graph," earlier in this chapter, for more on creating bullet graphs.
- 2. Change the alignment for the axis and other labels on the bullet graph so that they're rotated 270 degrees. (See Figure 9-15.)

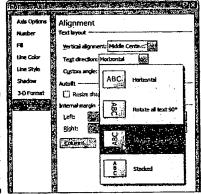
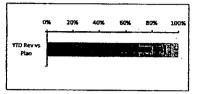


Figure 9-15: Rotate all labels so that they're on their sides.

3. Use Excel's Camera tool to take a picture of the bullet graph.

When you have a picture, you can rotate it to be horizontal! Figure 9-16 illustrates a horizontal bullet graph.

Figure 9-16: A horizontal bullet graph.



The nifty thing about this trick is that because the picture is taken with the Camera tool, the picture automatically updates when the source table changes.



Never heard of the Camera tool? Check out Chapter 6 for a detailed look at Camera tool.

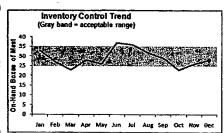
Showing Performance against a Target Range

In some businesses, a target isn't one value — it's a range of values. That is to say, the goal is to stay within a defined target range. Imagine you manage a small business selling boxes of meat. Part of your job is to keep your inventory stocked between 25 and 35 boxes in a month. If you have too many boxes of meat, the meat will go bad. If you have too few boxes, you'll lose money.

To track how well you do at keeping your inventory of meat between 25 and 35 boxes, you need a performance component that displays on-hand boxes against a target range.

Figure 9-17 illustrates a component you can build to track performance against a target range. The gray band represents the target range you must stay within each month. The line represents the trend of on-hand meat.

Figure 9-17:
You can
create a
component
that plots
performance
against a
target range.



Obviously, the trick to this type of component is to set up the band that represents the target range. Here's how you do it:

1. First, set up a *limit table* where you can define and adjust the upper and lower limits of your target range.

Cells B2 and B3 in Figure 9-18 serve as the place to define the limits for the range.

2. Build a chart feeder that's used to plot the data points for the target range.

This feeder consists of the formulas revealed in cells B8 and B9 in Figure 9-18.

The idea is to copy these formulas across the entire dataset. The values you see for Feb, Mar, and Apr are the results of these formulas.

Figure 9-18:
Create a
chart feeder
that
contains
formulas
that define
the data
points for
the target
range.

	it 1000 - 25	\$0.C.02	-orDesa	es E
	35			
	Jan	Feb	Mag	Apr
对位都实际	=\$B\$2	25	25	Apr 25
e urana	=58\$3.\$8\$2	10	10	10

Add a row for the actual performance values. (See Figure 9-19.)
 These data points create the performance trend line.

Figure 9-19: Add a row for the performance values.

A A		Mar.C.	يD. د	Ban Enge	lay of
2 6 6	2	5			
Salupparlamit	3				
76	Jan	Feb	Mar	Apr	M
8 allowed article	25	25	25	25	2
S. Opportunit	10	10	10	10	1
10 W 10 10 10 10 10 10 10 10 10 10 10 10 10	33	27	23	28	2

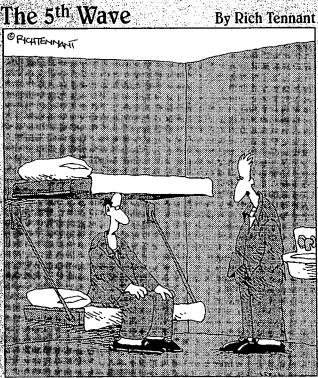
- 4. Highlight the entire chart feeder table and plot the data on a stacked area chart.
- 5. Right-click the Values series and choose Change Chart Type. Change the chart type to a line chart (no markers).
- Right-click the Values data series again and choose Format Data Series.

The Format Data Series dialog box appears.

- In the dialog box, click the Series Options button and click Secondary Axis.
- 8. Go back to your chart and delete the new axis that was added; it's the vertical axis to the right of the chart.
- Right-click the Lower Limit data series and choose Format Data Series.The Format Data Series dialog box appears again.
- 10. In the dialog box, click the Fill button and select the No Fill option.

That's it. All that's left to do is apply the minor formatting adjusts to colors, labels, and other formatting.

Part IV Advanced Reporting Techniques



"I started running 'what if' scenarios on my spreadsheet, like, 'What if I were sick of this dirtuad job and funneled some of the company's money into an off—shore account?'

In this part . . . This section focuses on techniques that help you automate your reporting processes and gives your users an interactive user interface. Chapter 10 provides a clear understanding of how macros can be leveraged to supercharge and automate your reporting systems. Chapter 11 illustrates how you can provide your clients with a simple interface, allowing them to easily navigate through and interact with their reporting systems.

Chapter 10

Macro-Charged Reporting

In This Chapter

- ▶ Introducing macros
- ▶ Discovering two methods of recording a macro
- ▶ Dealing with Excel security
- ▶ Understanding some macro examples

macro is essentially a set of instructions or code that you create to tell Excel to execute any number of actions. In Excel, macros can be written or recorded. The key word here is recorded.

The analogy I often use is that recording a macro is like programming a phone number into your cell phone. You first manually dial and save a number. Then when you want, you can redial those numbers with the touch of a button. Just as on a cell phone, you can record your actions in Excel while you perform them. While you record, Excel gets busy in the background, translating your keystrokes and mouse clicks to written code (also known as VBA; Visual Basic for Applications). After a macro is recorded, you can play back those actions anytime you wish.

In this chapter, I explore macros and reveal how you can use macros to automate your recurring processes to simplify your life.

Why Use a Macro?

The first step in using macros is admitting you have a problem. Actually, you have several problems:

✓ Problem 1: You're making donuts: You do the same tasks over and over again. As each new month rolls around, you have to make the donuts (that is, crank out those reports). You have to import that data. You have to refresh those pivot tables. You have to delete those columns, jump up, turn around, and do the hokey pokey. Who needs it? Wouldn't it be nice if you could fire up a macro and have those more redundant parts of your reporting processes done automatically?

✓ Problem 2: You're making mistakes: Admit it, your hand-to-hand combat style of using Excel leaves room for mistakes. When you're repeatedly applying formulas, sorting, and moving things around manually, there's always that risk of catastrophe. Add to that the looming deadlines and constant change requests, and your error rate goes up.

Why not calmly record a macro, ensure that everything is running correctly, and then forget it? The macro is sure to perform every action the same way every time you run it; reducing the chance of errors.

▶ Problem 3: You're making people mad: Remember that you're creating these dashboards and reports for an audience that probably has a limited knowledge of Excel. If your reports are a bit too difficult to use and navigate, you'll find that you'll slowly lose support for your cause.

It's always helpful to make your reports a bit more user-friendly. Here are some ideas for macros that make things easier for everyone:

- A macro to format and print a worksheet or range of worksheets at the touch of a button
- Macros that navigate a multi-sheet worksheet with a navigation page or with a go to button for each sheet in your workbook
- A macro that saves the open document in a specified location and then closes the application at the touch of a button

Obviously, each of the preceding examples can be performed in Excel without the aid of a macro. However, your audience will appreciate these little touches that help make perusal of your report a bit more pleasant.

Introducing the Macro Recorder

If you tried to skip ahead and create your own macro before reading this chapter, you may have found it difficult to pinpoint the *Macro Recorder* (the mechanism that lets you record macros). This is because the macro functionality is on the Developer tab, which is initially hidden in Excel 2007. By hidden, I mean you don't see a tab called Developer when you first open Excel 2007. You have to explicitly tell Excel to make it visible.

To enable the Developer tab, follow these steps:

- 1. Select the Office icon (in the upper-left corner of Excel).
- Click the Excel Options button.The Excel Options dialog box appears.
- Make sure the Popular options are showing and ensure that the Show Developer Tab in the Ribbon option has a check beside it. (See Figure 10-1.)

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Frigure 10-1:

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The Macro Recorder user interface

Now that you have the Developer tab showing in the Excel Ribbon, you can fire up the Macro Recorder and examine other critical macro options. Start up the Macro Recorder by selecting Record Macro from the Developer tab. This activates the Record Macro dialog box, as shown in Figure 10-2.



Figure 10-2: The Record Macro dialog box.

Here are the four parts of the Record Macro dialog box:

- At the top is a space for your macro name. This should be self-explanatory. Excel gives a default name to your macro, such as Macro1, but I find it's best practice to give your macro a name more descriptive of what it actually does. For example, you might name a macro that formats a generic table as FormatTable.
- ✓ Below the macro name field is the Shortcut Key field. Every macro or piece of code needs an event, or something to happen, for it to run. This event can be a button press, a workbook opening, or in this case, a keystroke combination. When you assign a shortcut key to your macro, entering that combination of keys triggers your macro to run. This is an optional field. You need not enter a shortcut key to run your macro.

- ✓ Next, you find the Store Macro In field. This Workbook is the default option. Storing your macro in This Workbook simply means that the macro is stored along with the active Excel file. The next time you open that particular workbook, the macro will be available to run. Similarly, if you send the workbook to another user, that user can run the macro as well (provided the macro security is properly set by your user but more on that later).
- Last, you see an option to enter a description for your macro. This is an optional field, but it can come in handy if you have numerous macros in a spreadsheet or if you need to give a user a more detailed description about what the macro does.

Recording macros with absolute references

Now that you've read about the basics of the Macro Recorder interface, it's time to go deeper and begin recording macros. The first thing you need to understand before you begin is that Excel has two modes for recording — absolute reference and relative reference.

Excel's default recording mode is in absolute reference. As you may know, the term *absolute reference* is often used in the context of cell references found in formulas. When a cell reference in a formula is an absolute reference, it does not automatically adjust when the formula is pasted to a new location.

The best way to understand how this concept applies to macros is to try it out. Open the Chapter 10 SampleFile.xlsx file and record a macro that counts the rows in the Branchlist worksheet. (See Figure 10-3.)

Figure 10-3: Your pretotaled worksheet containing two tables.

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12.	Region	Market	Branch			Region	Market	Branch
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10%	NORTH	BUFFALO	701407			SOUTH	CHARLOTTE	301301
		BUFFALO	802202			SOUTH	CHARLOTTE	302301
158	NORTH	CANADA	910181	i		SOUTH	CHARLOTTE	601306
	NORTH	CANADA	920681			SOUTH	DALLAS	202600
74	NORTH	MICHIGAN	101419			SOUTH	DALLAS	490260
10 8	NORTH	MICHIGAN	501405		-	SOUTH	DALLAS	490360
197	NORTH	MICHIGAN	503405			SOUTH	DALLAS	490460
501	NORTH	MICHIGAN	590140			SOUTH	FLORIDA	301316
411 412	NORTH	NEWYORK	801211			SOUTH	FLORIDA	701309
112	NORTH	NEWYORK	802211		i	SOUTH	FLORIDA	702309
\$137	NORTH	NEWYORK	804211			SOUTH	NEWORLEANS	601310
34	HTROM	NEWYORK	805211			SOUTH	NEWORLEANS	602310
	NORTH	NEWYORK	806211			SOUTH	NEWORLEANS	801607



The sample dataset used in this chapter can be found on this book's companion Web site.

Follow these steps to record the macro:

- 1. Before recording, make sure cell A1 is selected.
- 2. Select Record Macro from the Developer tab.
- 3. Name the macro AddTotal.
- 4. Choose This Workbook for the save location.
- 5. Click OK to start recording.

At this point, Excel is recording your actions. While Excel is recording, perform the following steps:

- 6. Select cell A16 and type Total in the cell.
- 7. Select the first empty cell in Column D (D16) and type = COUNTA(D2:D15).

This gives a count of branch numbers at the bottom of column D. You need to use the COUNTA function because the branch numbers are stored as text.

8. Press Stop Recording from the Developer tab to end recording the macro.

The formatted worksheet should look like something like the one in Figure 10-4.

CA STATE				安全E 20			A COLUMN		
\$(9)	Region	Market	Branch			Region	Market	Branch	
¥2¥	NORTH	BUFFALO	601419					173901	
20	NORTH	BUFFALO	701407			SOUTH	CHARLOTTE	301301	
22 3 3	NORTH	BUFFALO	802202		1	SOUTH	CHARLOTTE	302301	
358	NORTH	CANADA	910181]	SOUTH	CHARLOTTE	601306	
/6:	NORTH	CANADA	920681		1	SOUTH	DALLAS	202600	
374	NORTH	MICHIGAN	101419			SOUTH	DALLAS	490260	
383	NORTH	MICHIGAN	501405	1	Ī	SOUTH	DALLAS	490360	
39	NORTH	MICHIGAN	503405			SOUTH	DALLAS	490460	
90 93 92	NORTH	MICHIGAN	590140	1		SOUTH	FLORIDA	301316	
43	NORTH	NEWYORK	801211				FLORIDA	701309	<u> </u>
32	NORTH	NEWYORK	802211				FLORIDA	702309	
2137	NORTH	NEWYORK	804211		I		NEWORLEANS		
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Figure 10-4: Your posttotaled worksheet.

There you have it; you've recorded your first macro!

To see your macro in action, delete the total row you just added and play back your macro by following these steps:

- 1. Select Macros from the Developer tab.
- 2. Find and select the AddTotal macro you just recorded.
- 3. Click the Run button.

Pretty cool huh? The macro played back your actions to a T and gave your table a total.

Now here's the thing. No matter how hard you try, you can't make the AddTotal macro work on the second table. Why? Because you recorded it as an absolute macro.

To understand what this means, examine the underlying code. Don't run for the hills just yet; it's not as scary as it seems.

To examine the code, select Macros from the Developer tab to get the Macro dialog box you see in Figure 10-5.

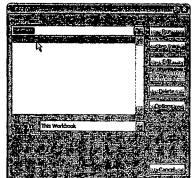


Figure 10-5: The Excel Macro dialog box.

Select the AddTotal macro and click the Edit button. This opens the Visual Basic Editor to show you the code that was written when you recorded your macro:

Sub AddTotal()

Range("A16").Select

ActiveCell.FormulaR1C1 = "Total"

Range("D16").Select

ActiveCell.FormulaR1C1 = "=COUNTA(R[-14]C:R[-1]C)"

End Sub

Pay particular attention to lines two and four of the macro. When you asked Excel to select cell range A16 and then D16, those cells are exactly what it selected. Because the macro was recorded in absolute reference mode, Excel

interpreted your range selection as absolute. In other words, if you select cell A16, that cell is what Excel gives you. In the next section, you take a look at what the same macro looks like when recorded in relative reference mode.

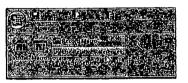
Recording macros with relative references

In the context of Excel macros, *relative* means relative to the currently active cell. So you should use caution with your active cell choice — both when you record the relative reference macro and when you run it.

First, make sure the Chapter 10 SampleFile.xlsx file is open. (This file is available on this book's companion Web site.) Then, use the following steps to record a relative-reference macro:

1. Select the Use Relative References option from the Developer tab, as demonstrated in Figure 10-6.

Figure 10-6: Select relative reference macro recording.



- 2. Before recording, make sure cell A1 is selected.
- 3. Select Record Macro from the Developer tab.
- 4. Name the macro AddTotalRelative.
- 5. Choose This Workbook for the save location.
- 6. Click OK to start recording.
- 7. Select cell A16 and type Total in the cell.
- Select the first empty cell in Column D (D16) and type = COUNTA(D2:D15).
- Press Stop Recording from the Developer tab to end recording the macro.

At this point, you have two macros recorded. Take a moment to examine the code for your newly-created macro.

Select Macros from the Developer tab to get the Macro dialog box. Here, choose the AddTotalRelative macro and click Edit.

Again, this opens the Visual Basic Editor to show you the code that was written when you recorded your macro. This time, your code looks something like the following:

Sub AddTotalRelative()

ActiveCell.Offset(15, 0).Range("A1").Select

ActiveCell.FormulaR1C1 = "Total"

ActiveCell.Offset(0, 3).Range("A1").Select

ActiveCell.FormulaR1C1 = "=COUNTA(R[-14]C:R[-1]C)"

End Sub

Do you notice anything different about code lines two and four? There are no references to any specific cell ranges at all! Of course you see "A1", but that's just the starting point. How does this code define where to *make* the changes? Well, without getting too technical, let's take a quick look at what the relevant parts of this VBA code really mean.

Notice that in line 2, Excel uses the Offset property of the active cell. This property tells the cursor to move a certain number of cells up or down and a certain number of cells left or right.

The Offset property code tells Excel to move 15 rows down and 0 columns across from the active cell (in this case, A1). So there's no need for Excel to explicitly select a cell as it did when recording an absolute reference macro.

To see this macro in action, delete the total row for both tables and do the following.

- 1. Select cell Al.
- 2. Select Macros from the Developer tab.
- 3. Find and select the AddTotalRelative macro.
- 4. Click the Run button.
- 5. Select cell F1.
- 6. Select Macros from the Developer tab.
- 7. Find and select the AddTotalRelative macro.
- 8. Click the Run button.

Notice that this macro, unlike your previous macro, works on both sets of data! Because the macro applies the totals *relative* to the currently active cell, the totals are applied correctly.

For this macro to work, you simply need to ensure that

- You've selected the correct starting cell before running the macro.
- The block of data has the same number of rows and columns as the data on which you recorded the macro.

Hopefully this simple example has given you a firm grasp of macro recording with both absolute and relative references.

Assigning a macro to a button

When you create macros, you want to give your audience a clear and easy way to run each macro. A basic button, used directly in the dashboard or report, can provide a simple but effective user interface.

As luck would have it, Excel offers a set of controls — Form controls — designed specifically for creating user interfaces directly on spreadsheets. There are several different types of Form controls, from buttons (the most-commonly-used control) to scrollbars.

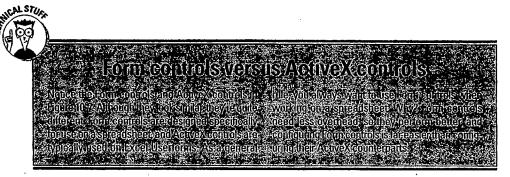
The idea behind using a Form control is simple. You place a Form control on a spreadsheet and then assign a macro to it — that is, a macro you've already recorded. When a macro is assigned to the control, that macro is executed, or played, when the control is clicked.

Take a moment to create a button for the AddTotalRelative macro you created earlier. Here's how:

- 1. Click the Insert drop-down list under the Developer tab. (See Figure 10-7.)
- 2. Select the Button Form Control.

Figure 10-7: You can find the Form controls in the Developer tab.

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3. Click the location you want to place your button.

When you drop the button control onto your spreadsheet, the Assign Macro dialog box, as shown in Figure 10-8, activates and asks you to assign a macro to this button.

4. Select the macro you want to assign to the button and then click OK.

At this point, you have a button that runs your macro when you click it! Keep in mind that all the controls in the Forms toolbar work in the same way as the command button, in that you assign a macro to run when the control is selected.



The buttons you create come with a default name, such as Button3. To rename your button, right-click the button and then click the existing name. Then you can delete the existing name and replace it with a name of your choosing.



Figure 10-8: Assign a macro to the newlyadded button.

Macro Security in Excel 2007

For better or worse, Microsoft has introduced some significant security changes for Office 2007. It's important to understand the impact of these changes so that you can help your audience use your macros without crashing and burning.

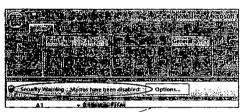
One of the most significant changes for Excel 2007 is that macros are disabled by default under certain circumstances. For example, if you create the Excel macro file and use it on your computer, your macros work fine. However, when another user tries to use macros in a file you've created, the macros are disabled.

With earlier versions of Excel, you'd often see a pop-up box informing you that the file contains macros. Depending on your Excel security settings, you'd have the option to enable or disable macros in the file. This is no longer the case for 2007.

If users open one of your Excel 2007 file, they get a small message under the Ribbon stating that Macros Have Been Disabled. The message looks like Figure 10-9.

As noble as the aim of these security features are, I have to admit it's a little annoying. There are actually two ways to overcome this security block. That is, there's a short-term solution and a long-term solution. These are discussed in the next two sections.

Figure 10-9: Security warning when macros are present.



The short-term solution to disabled macros

The short-term solution is to temporarily enable the macro content in the current workbook. This allows you to use the macros during the current session, but Excel blocks the macros each time the workbook is opened.

To temporarily enable the content, simply click the Options button beside the warning message to activate the Microsoft Office Security Options dialog box, as shown in Figure 10-10. Here, they can select the Enable This Content option to activate the use of macros for this session.

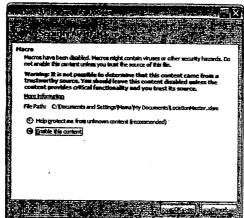


Figure 10-10: Enabling macros option.

The long-term solution to disabled macros

The long-term solution is to set up a trusted location for your files. A trusted location is a directory that is deemed a safe zone where only trusted workbooks are placed. A trusted location allows you and your clients to run a macro-enabled workbook with no security restrictions as long as the workbook is in that location.

To set up a trusted location, follow these steps:

1. Select the Macro Security button on the Developer tab.

This activates the Trust Center dialog box.

2. Select the Trusted Locations button.

This opens the Trusted Locations menu (see Figure 10-11), which shows you all the directories that are considered trusted.

- 3. Click the Add New Location button.
- 4. Click Browse to find and specify the directory that will be considered a trusted location.

After you specify a trusted location, any Excel file that's opened from this location will have macros automatically enabled. The idea is to have your clients specify a trusted location and use your Excel files from there.

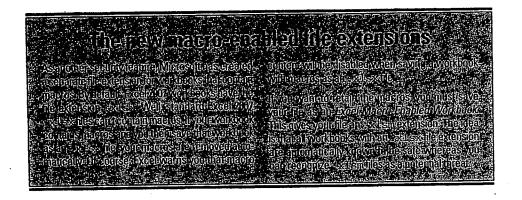
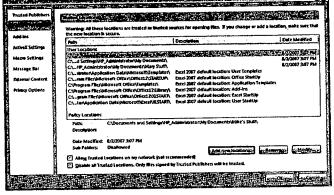


Figure 10-11:
The Trusted
Locations
menu allows
you to add
directories
that are
considered
trusted.



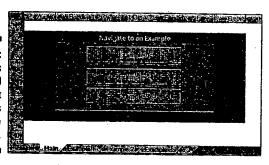
Excel Macro Examples

Covering the fundamentals of building and using macros is one thing. Coming up with good ways to incorporate them into your reporting processes is another. Take a moment to review a few examples of how you can implement macros in your dashboards and reports. Open the Chapter 10 SampleFile.xlsx file found on this book's companion Web site to follow along in the next section.

Building navigation buttons

The most common use of macros is navigation. Workbooks that have many worksheets or tabs can be frustrating to navigate. To help your audience, you can create some sort of a switchboard, like the one shown in Figure 10-12. When a user clicks the Example 1 button, he's taken to the Example 1 sheet.

Figure 10-12: Use macros to build buttons that help users navigate your reports.



Creating a macro to navigate to a sheet is quite simple. You start at the sheet that will become your switchboard or starting point and then start recording a macro. While recording, click the destination sheet (the sheet this macro will navigate to). After you click the destination sheet, stop recording the macro. It's as easy as that.



It's useful to know that Excel has a built-in Hyperlink feature, allowing you to convert the contents of a cell into a hyperlink that links to another location. That location can be a separate Excel workbook, a Web site, or even another tab in the current workbook. Although using a hyperlink may be easier than setting up a macro, you can't apply a hyperlink to Form controls (like buttons). Instead of a button, you'd use text to let users know where they'll go when they click the link.

Dynamically rearranging pivot table data

In the example illustrated in Figure 10-13, macros allow a user to change the perspective of the chart simply by selecting any one of the buttons shown.

Figure 10-13: This report allows users to choose their perspective.

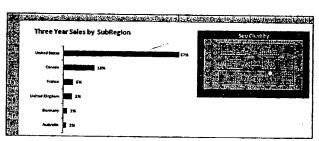
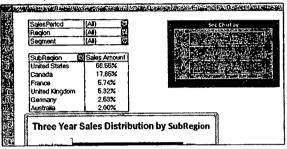


Figure 10-14 reveals that the chart is actually a pivot chart tied to a pivot table. The recorded macros assigned to each button are doing nothing more than rearranging the pivot table to slice the data using various pivot fields.

To create this type of setup, you first create a pivot table and a pivot chart. Next, start recording a macro. While recording, move a pivot field from one area of the pivot table to the other. When you're done, stop recording the macro. Record another macro to move the data field back to its original position. After both macros are set up, you can fire them in turn to see your pivot field dynamically move back and forth.

Figure 10-14:
The macros behind these buttons rearrange the data fields in a pivot table.

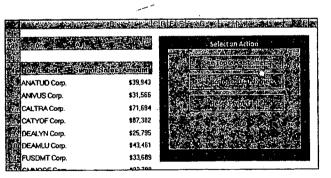


Offering one-touch reporting options

The last two examples demonstrate that you can record any action that you find of value. That is, if you think users would appreciate a certain feature being automated for them, why not record a macro to do so?

In Figure 10-15, notice that you can filter the pivot table for top or bottom 20 customers. Because I pre-recorded the steps to filter a pivot table for the top and bottom 20, my users don't have to. This not only saves them time and effort, but it also allows users that don't know how to take these actions to benefit from them.

Figure 10-15: Help your audience save time and effort by offering prerecorded views.





Feel free to visit Chapter 3 for a refresher on how create the top and bottom reports you see in Figure 10-15.

Figure 10-16 demonstrates how you can give your audience a quick and easy way to see the same data on different charts. Don't laugh too quickly at the uselessness of this example. I actually worked for a guy who wanted to see two different charts with the same data. Instead of taking up real estate, I just recorded a macro that changed the Chart Type of his chart. He could switch views to his heart's content.

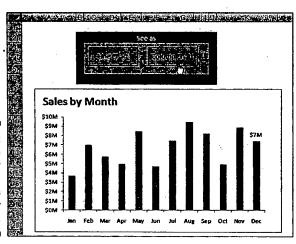


Figure 10-16: You can give your audience a choice in how they see data.

Chapter 11

Giving Users an Interactive Interface

In This Chapter

- ▶ Introducing, adding, and configuring Form controls
- **▶** Using Check Box controls
- **▶** Using Option Buttons
- ▶ Offering choices with Combo Boxes and List Boxes

h, life was so much simpler in the days of one-view reports and static dashboards. Remember the good old days when a static report was enough to have managers carrying you on their shoulders?

Today, managers increasingly want to be *empowered* to switch from one view of data to another with a simple selection from a menu of choices. For those of us who build dashboards and reports, this *empowerment* comes with migraines and acid reflux. How do you handle a manager that wants to see multiple views for multiple regions or markets?

Fortunately, Excel does offer a handful of tools that enable you to add interactivity into your reports. With these tools and a bit of creative data modeling, you can give your managers the choices they crave with relative ease.

In this chapter, I show you how to incorporate menus, options, and selectors into your reporting mechanisms and offer a few useful examples you can implement into your processes.

Introducing Form Controls

Excel offers a set of controls called *Form controls*, designed specifically for creating user interfaces directly on a spreadsheet. The idea behind using a Form control is simple. You place a Form control on a spreadsheet and then configure it to give it a specific task.

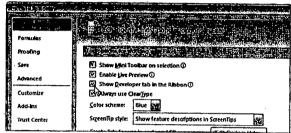
Excel's Form controls can be found on the Developer tab, which is initially hidden in Excel 2007. By hidden, I mean you don't see a tab called Developer when you first open Excel 2007. You have to explicitly tell Excel to make it visible. To enable the Developer tab, follow these steps:

- 1. Select the Office icon (in the upper-left corner of Excel).
- 2. Click the Excel Options button.

The Excel Options dialog box appears.

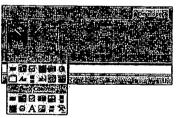
Make sure the Popular options are showing and ensure that the Show Developer Tab in the Ribbon option has a check beside it. (See Figure 11-1.)

Figure 11-1: Enabling the Developer tab.



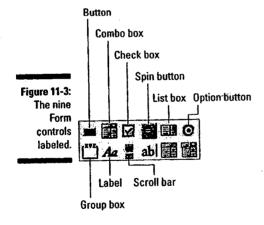
When the Developer tab is visible, click it and select the Insert Icon button, as shown in Figure 11-2. Here you find two sets of controls: Form controls and ActiveX controls. Form controls are designed specifically for use on a spreadsheet whereas ActiveX Controls are typically used on Excel Userforms. Because Form controls need less overhead and can be configured far easier than their ActiveX counterparts, you generally want to use Form controls.

Figure 11-2: Form controls and ActiveX controls



Here are the nine form controls you can use directly on a spreadsheet (see Figure 11-3). They are as follows:

- ▶ Button: Provides users with a button that, when clicked, executes an assigned macro.
- Combo Box: Gives users an expandable list of options from which to choose.
- ✓ Check Box: Provides a mechanism for a select/unselect scenario. When
 the Check Box is selected, it returns a value of True. When it isn't
 selected, False is returned.
- Spin Button: Enables users to easily increment or decrement a value by clicking the arrow buttons provided.
- List Box: Gives users a list of options from which to choose.
- ✓ Option Button: Enables users to toggle through several options one at a time. The idea is to have two or more Option Buttons in a group. Then selecting one Option Button automatically deselects the others.
- Scroll Bar: Provides users a mechanism to scroll to a value or position using a sliding scale that can be moved by clicking and dragging the mouse
- ✓ Label: True to its name, this control allows you to add text labels to your spreadsheet. You can also assign a macro to the label, effectively using it as a button of sorts.
- ✓ Group Box: Typically used for cosmetic purposes, this control serves as a container for groups of controls.

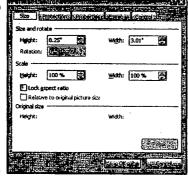


Adding and Configuring Controls

To add a control onto the spreadsheet, simply click the control you require and click the spreadsheet in the approximate location you want the control placed. You can easily move and resize the control just as you would a chart or shape.

After you add a control, you want to configure it to define its look, behavior, and utility. Each control has its own set of configuration options that allow you to customize it for your purposes. To get to these options, right-click the control and select Format Control, as demonstrated in Figure 11-4. This opens the Format Control dialog box with all the configuration options for that control.

Figure 11-4:
Rightclicking and selecting Format Control opens a dialog box with the configuration options.



You'll notice in Figure 11-4 that there are five tabs listed in the Format Control dialog box: Size, Protection, Properties, Web, and Control.



All but two controls have the Size, Protection, Properties, Web, and Control tabs in their configuration options (the Button and label controls don't have the Control tab). These tabs work the same way for each control. A handful of controls do have additional formatting-oriented tabs used to configure formatting options.

These tabs are as follows:

- ✓ The Protection tab: Allows you to specify how the control will behave
 when the worksheet is in a protected state. Here you can choose to
 disable or enable the control when the worksheet is protected.
- ✓ The Properties tab: Lets you control how the control is positioned in relation to the cells and columns in your spreadsheet. Here, you can specify

whether you want the control to be resized or re-positioned when the worksheet cells are adjusted. You can also specify whether you want the control to be printed.

- ✓ The Web tab: Expose some options that determine how the control will behave when the worksheet is saved as an HTML Web page.
- ✓ The Control tab: This tab, which is different for each control, is where the meat of the configuration lies. Here, you find the variables and settings that need to be defined in order for the control to function.

Now that I've covered the administrative aspects of how Form controls work, you're ready for the rest of this chapter. Throughout, I offer some examples of how to use the most practical controls, demonstrating how each one works. Plus, I walk you through a scenario for each control, showing how the control can enhance your reporting mechanisms.

Using the Button Control

The Button control gives your audience a clear and easy way to execute the macros you've recorded. To insert and configure a Button control, follow these steps:

- 1. Click the Insert drop-down list under the Developer tab.
- 2. Select the Button Form control.
- 3. Click the location in your spreadsheet where you want to place your button.

The Assign Macro dialog box appears and asks you to assign a macro to this button. (See Figure 11-5.)

4. Select the macro you want to assign to the button and then click OK.

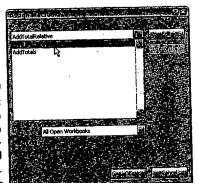


Figure 11-5:
Assign a macro to the newlyadded button.

Edit the text shown on the button by right-clicking the button, highlighting the existing text, and then overwriting it with your own.



To assign a different macro to the button, simply right-click and select Assign Macro to reactivate the Assign Macro dialog box, as shown in Figure 11-5.

Using the Check Box Control

The Check Box control provides a mechanism for selecting/deselecting options. When a Check Box is selected, it returns a value of True. When it isn't selected, False is returned. To add and configure a Check Box control, follow these steps:

- 1. Click the Insert drop-down list under the Developer tab.
- 2. Select the Check Box Form control.
- Click the location in your spreadsheet where you want to place your Check Box.
- After you drop the Check Box control onto your spreadsheet, rightclick the control and select Format Control.
- Click the Control tab to see the configuration options, as shown in Figure 11-6.
- 6. First, select the state in which the Check Box control should open.

 The default selection (I behave led) trained.

The default selection (Unchecked) typically works for most scenarios, so it's rare you have to update this selection.

7. Next, in the Cell Link box, enter the cell to which you want the Check Box to output its value.

By default, a Check Box control outputs either True or False, depending on whether it's checked. Notice in Figure 11-6 that this particular Check Box outputs to cell A5.

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Value -				4
@ und	hedrad			-
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⊕ ₩∞	id			
Cellirik	\$A\$5	 E		
® 3-0 sh	ading			

Figure 11-6: Formatting the Check Box Control.

- 8. (Optional) You can check the 3D property if you want the control to have a three-dimensional appearance.
- 9. Click OK to apply your changes.

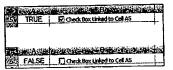


To rename the Check Box control, right-click the control, select Edit Text, and then overwrite the existing text with your own.

As Figure 11-7 illustrates, the Check Box outputs its value to the specified cell. If the Check Box is selected, a value of TrueTrue is output. If the Check Box isn't selected, a value of FalseFalse is output.

If you're having a hard time figuring out how this could be useful, fear not. I have an example that illustrates how a Check Box can be used to toggle a chart series on and off!

Figure 11-7: The two states of the Check Box.



Check Box Example: Toggling a Chart Series On and Off

Figure 11-8 shows the same chart twice. Notice that the top chart contains only one series, with a Check Box offering to Show 2004 Trend data. The bottom chart shows the same chart with the Check Box selected. The on/off nature of the Check Box control is ideal for when interactivity calls for a visible/not visible state.



To see all the examples in this chapter live, open the Chapter 11 Sample File available on this book's companion Web site.

To create this example, I start with raw data that contains both 2004 and 2005 data (see Figure 11-9). Next to the raw data, I reserve a cell where the Check Box control will output its value (Cell A12 in this example). This cell will either contain TrueTrue or False.

I then create a shadow dataset that consists of all formulas, as shown here in Figure 11-10. The idea is that the chart actually reads from this data, not the raw data. This way, I can control what the chart sees.

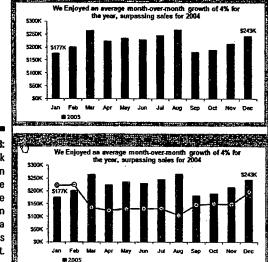


Figure 11-8:
A Check
Box can
help create
the
disappearin
g data
series
effect.

Figure 11-9: Start with raw data and a cell where a Check Box can output its value.

A.A.	SHOUL STATE	MOORE	=0.	Service Contract	CONTRACT OF	E Gara	6.1
		Raw Onta		1		1	-
oggle for							
2004 Data		- Jan	Feb	Mar	Apr	Ltay	
	2004	\$222,389	\$224,524	\$136,104	\$125,260	\$130,791	\$
	2005	\$176,648	\$201,000	\$265,720	\$225,461	\$235,494	3
	Toggle for 2004 Data	Toggle for 2004 Data 2004 Data	Raw Deta	Raw Onta	Raw Deta	Raw Deta	Toggle for 2804 Data John Feb Mar Apr May 2804 Data 2004 5222.389 5224.524 \$136,104 \$125.280 \$130,791

Figure 11-10:
Create a shadow dataset that will feed the chart. The values of this dataset are all formulas.

		1		I	Τ.
		Jan	Feb	Mar	
	2004	A COURT OF THE PERSON	SCHOOL STATE	THE PROPERTY AND THE PARTY	13
	2005		OTHER SECTION	EXP-PAPE	X
				1	Т
					Т
		Rany Oats	l		T
Toggle for					
2004 Date		Jan	Fcb	Mar	
1.5	2004	Z22389	224524	136104	112
	2005	176648	201000	265720	22
	2004 Data	Ze05 Toggle for Z004 Data	2004 2/2/2010 2/1/2010 2/	2004 2/2/2010 2/1/2010 2/2/2010 2/	2004 2/4/2011 2/

As you can see in Figure 11-10, the formulas for the 2005 row simply reference the cells in the raw data for each respective month. I do that because I want the 2005 data to show at all times.

For the 2004 row, I test the value of Cell A12 (the cell that contains the output from the Check Box). If A12 reads True, I reference the respective 2004 cell in the raw data. If A12 doesn't read True, the formula uses Excel's NA() function to return an #N/A error. Excel charts can't read any cell with the #N/A error. Therefore, they simply don't show the data series for any cell that contains #N/A. This is ideal when you don't want a data series to be shown at all.

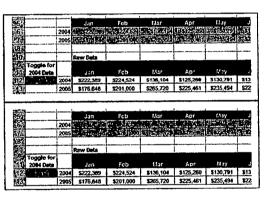


Notice that the formula shown in Figure 11-10 uses an absolute reference with cell A12. That is, the reference to cell A12 in the formula is prefixed with a \$ sign (\$A12). This ensures that the column references in the formulas don't shift when they're copied across.

Figure 11-11 illustrates the two scenarios in action. In the scenario shown at the top of Figure 11-11, Cell A12 is True, so the shadow dataset actually brings in 2004 data. In the scenario shown at the bottom of Figure 11-11, Cell A12 is False, so the shadow dataset returns #N/A for 2004.

After this setup is created, all that's left to do is create the chart using the shadow data. As you can see, the combination of clever data modeling and a Check Box control can produce some pretty cool effects.

Figure 11-11:
When Cell
A12 reads
True, 2004
data is
displayed;
when it
reads False,
the 2004 row
shows only
#N/A errors.



Using Option Button Controls

Option Buttons allow users to toggle through several options one at a time. The idea is to have two or more Option Buttons in a group. Then selecting one Option Button automatically deselects the others. To add Option Buttons to your worksheet, follow these steps:

- 1. Click the Insert drop-down list under the Developer tab.
- 2. Select the Option Button Form control.
- 3. Click the location in your spreadsheet where you want to place your Option Button.
- 4. After you drop the control onto your spreadsheet, right-click the control and select Format Control.
- 5. Click the Control tab to see the configuration options, as shown in Figure 11-12.
- 6. First, select the state in which the Option Button should open.

The default selection (Unchecked) typically works for most scenarios, so it's rare you have to update this selection.

Next, in the Cell Link box, enter the cell to which you want the Option Button to output its value.

By default, an Option Button control outputs a number that corresponds to the order it was put onto the worksheet. For instance, the first Option Button you place on your worksheet outputs a number 1; the second outputs a number 2; the third outputs a number 3; and so on. Notice in Figure 11-12 that this particular control outputs to cell A1.

- 8. (Optional) You can check the 3D property if you want the control to have a three-dimensional appearance.
- 9. Click OK to apply your changes.
- 10. To add another Option Button, simply copy the button you created and paste as many Option Buttons as you need.

The cool thing about copying and pasting is that all the configurations you made to the original persist in all the copies.



To give your Option Button a meaningful label, right-click the control, select Edit Text, and then overwrite the existing text with your own.

Figure 11-12: Formatting the Option Button

control.

Value			
○ Hbood			
Cell link: SA	\$1	Œ	
20 shadi	10		

Option Button Example: Showing Many Views through One Chart

One of the ways you can use Option Buttons is to feed a single chart with different data, based on the option selected. Figure 11-13 illustrates an example of this. When each category is selected, the single chart is updated to show the data for that selection.

Now, you could create three separate charts and show them all on your dashboard at the same time. However, using this technique as an alternative saves on valuable real estate by not having to show three separate charts. Plus, it's much easier to troubleshoot, format, and maintain one chart than it is three.

To create this example, I start with three raw datasets (as shown in Figure 11-14) that contain three categories of data: Income, Expense, and Net. Near the raw data, I reserve a cell where the Option Buttons output their values (Cell A8 in this example). This cell contains the ID of the option selected: 1, 2, or 3.

Figure 11-13: This chart is dynamically fed different data based on the selected Option Button.

\$500K	Net	- version of the second of the		
\$400K				
\$300K -		New Y		75
\$200K -	_			
\$100K	38		(2002)	
şox -				
-\$100K -			=	
-\$200K	Q1	02	Q3	Q4
@ 2003 Net	\$88,088	\$289,218	\$62,710	\$301,529
■ 2004 Net	\$498	\$185,024	-\$94,375	\$403,824
= 2005 Net	\$179,387	\$78,590	\$31,912	\$103,162

Figure 11-14:
Start with
the raw
datasets
and a cell
where the
Option
Buttons can
output their
values.

ν,	U. C. STEEL	Back	200	AMP A	张在秀章	6000
	Option Button					
3	Trigger					
			Q1	Q2	Q3	đ
14		2005 Income				
M ₁		2004 Income				
71		2003 Income	\$159,832	\$289,825	\$181,961	\$456,016
12						
â		2005 Expense	\$219,967	\$495,072	\$212,749	\$687,744
Ø.		2004 Expense	\$219,468	\$310,048	\$307,124	\$283,920
35		2003 Expense	\$71,744	\$607	\$119,251	\$154,487
16						
3.7		2005 Net	\$179,387	\$78,590	\$31,912	\$103,162
18		2004 Net	\$498	\$185,024	-594,375	\$403,824
119		2003 Net	\$88,088	\$289,218	\$62,710	\$301,529

I then create a shadow dataset that consists of all formulas, as shown in Figure 11-15. The idea is that the chart reads from this shadow dataset, allowing you to control what the chart sees. The first cell of the shadow dataset contains the following formula:



This formula tells Excel to check the value of cell A8 (the cell where the Option Buttons output their values). If the value of cell A8 is 1, which represents the value of the Income option, the formula returns the value in the Income dataset (cell B9). If the value of cell A8 is 2, which represents the value of the Expense option, the formula returns the value in the Expense dataset (cell B13). If the value of cell B1 is not 1 or 2, the value in cell B17 is returned.



Notice that the formula shown in Figure 11-15 uses absolute references with cell A8. That is, the reference to cell A8 in the formula is prefixed with \$ signs (\$A\$8). This ensures that the cell references in the formulas don't shift when they're copied down and across.

To test that the formula is working fine, you could change the value of cell A8 manually, from 1 to 3. When the formula works, you'd simply copy the formula across and down to fill the rest of the shadow dataset.

When the setup is created, all that's left to do is create the chart using the shadow data. Again, the major benefits you get from this type of setup is that any formatting changes can be made to one chart, and it's easy add another dataset by adding another Option Button and editing your formulas.

Figure 11-15: Create a shadow dataset and enter this formula in the first cell.

	Service Control of the Control of the	
20		
	2007年10日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日	
23		
5x		
Option Button Trigger		
3 S		Q1
99	2005 Income	399353.9
10:	2004 income	
	2003 tocome	219966.6 159831.87
33	2005 Expense	219966.6
40	2004 Expense	219468.16
5	2003 Expense	71743.63
(%)	2005 Net	179387.3
86	2004 Net	498.440000000002
9	2003 Net	88088.24
are .		

Using the Combo Box Control

The Combo Box control allows users to select from a list of predefined options from a drop-down list. The idea is that when an item from the Combo

Box control is selected, some action is taken with that selection. To add a Combo Box to your worksheet, follow these steps:

- 1. Click the Insert drop-down list under the Developer tab.
- 2. Select the Combo Box Form control.
- Click the location in your spreadsheet where you want to place your Combo Box.
- 4. After you drop the control onto your spreadsheet, right-click the control and select Format Control.
- 5. Click the Control tab to see the configuration options, as shown in Figure 11-16.
- In the Input Range setting, identify the range that holds the predefined items you want to present as choices in the Combo Box.

As you can see in Figure 11-16, this Combo Box is filled with months.

7. Next, in the Cell Link box, enter the cell to which you want the Combo Box to output its value.

By default, a Combo Box control outputs the index number of the selected item. This means if the second item on the list was selected, the number 2 would be output. If the fifth item on the list was selected, the number 5 would be output. Notice in Figure 11-16 that this particular control outputs to cell E15.

8. In the Drop Down Lines box, enter the number of items you want shown at one time.

As you can see in Figure 11-6, this control is formatted to show 12 items at one time. This means when the Combo Box is expanded, the user sees 12 items.

- (Optional) You can check the 3D property if you want the control to have a three-dimensional appearance.
- 10. Click OK to apply your changes.

1	A CONTRACTOR	THE FEMALE NOW	A STANKE LOW	A SECTION	ed K 2	27.00
40				1	1	
2	January	Section City Co.	All and the second	100	and the second	ı,×
	February	PARTIE COMP	and the second second		A 174	
Ŕ.	March	STATE OF STREET	ton a separate a week	Control	有企业企 业	
	April	- Input range:	Actoutesus	[48]		. 🏗
(a)	Mary		\$E\$2:\$E\$13	15		覈
1	June	Cell link:	\$E\$15	題		蹬
10.	July	Prop down lines:	12			鼮
E.	August		لسسا			鱹
510	September	₩ 20 shading				
16	October	T d				瀖
W	November					摩
ric.	December					
Sil			•			뭹
35		H				
(16)						-4
177				A 100 THE PERSON NAME OF THE PER	A	E)

Figure 11-16: Formatting the Combo Box control.

Combo Box Example: Controlling Multiple Pivot Tables with One Combo Box

Here's the deal. The report in Figure 11-17 contains two pivot tables — one showing revenue for the selected market and one showing volume. Note that each pivot table has its own Filter field, allowing for the selection of a Market. The problem is that each time a market is selected from the Filter field in one pivot table, the same market from the Filter field in the other pivot table must be selected to ensure the correct Volume versus Revenue.

Figure 11-17:
You must
synchronize
multiple
pivot table
reports to
get the
correct
analysis.

Sales Amount		2		
	t# 2003			
Segment ,		G1.5	GA2	
Accessories	\$1,545	\$3,254	\$12,426	. 5
(filos	\$604,274	\$690,286	\$540,421	54
Clothing	\$11,793	\$18,682	\$26,538	\$2
Components	\$52,285	\$141,635	\$180,818	\$5
Grand Total	\$689,898	\$854,856	\$764,202	\$5
war - neiderlike ut	h we was a month			
Sum of Dideror		S	Volume Tr	end
Sum of DriderQr	11572480 E1	S		end
Sum of DiderQr		£≟ G1r2		end
	22			end
Segment 🖫	Qtr1	Ctr2	Otr3	end
Segment (E)	Qtr1 84	C1r2 181	Qtr3 557	end
Segment (R) Accessories Bitos	Qtr1 84 753	6172 181 859	Otr8 557 666	end

Not only is it annoying to have to synchronize both pivot tables each time you want to analyze a new market's data, but there's a chance you, or your audience, may forget to do so.

A Combo Box control can help in this situation. The idea is to record a macro that automatically selects a market from the Market field of both tables. Then alter the macro to filter both pivot tables, using the value selected from a Combo Box control.

Using the Chapter 11 Sample File that appears on this book's companion Web site, take a moment to walk through this example with me. For this example, use the pivot tables found in the Using Combo Box Controls tab of the sample file.

 Create a new macro and call it SwitchMarkets. When recording starts, select the Southwest market from the Market field in both pivot tables and then stop recording.

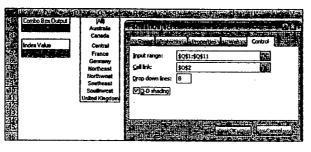


Feel free to review Chapter 10 for a refresher on how to record macros.

- 2. Place a Combo Box onto your spreadsheet.
- Right-click your Combo Box and select Format Control.The Format Control dialog box appears.
- 4. Specify an Input Range for the list you're using to fill your Combo Box. In this case, reference the list of markets already created in column Q.
- 5. Next, specify a Cell Link.

This is the cell that shows the index number of the item you select (cell O2 is the cell link in this example). When you've configured your Combo Box, your dialog box should look similar to Figure 11-18.

Figure 11-18: Configure the settings for your Combo Box.



At this point, you can now select a market from your Combo Box and see the associated index number in cell O2. In order to make use of this index number, you have to pass it through the INDEX function. The INDEX function converts an index number to a value that can be recognized.

An INDEX function requires two arguments in order to work properly. The first argument is the range of the list you're working with. In most cases, use the same range that's feeding your Combo Box. The second argument is the index number. If the index number is in a cell (like in cell O2), you can simply reference the cell.

6. In cell O5, enter an INDEX function that converts the index number in cell O2 to a value.

As you can see in Figure 11-19, the formula used is =INDEX(Q1:Q11,O2).

The trick now is to edit the SwitchMarkets macro you recorded earlier to use the value in cell O5, instead of a hard-coded value. This calls for editing the macro-generated code via the Visual Basic Editor. Don't worry, it won't get too crazy.

7. Click the Macros button on the Developer tab.

This activates the Macro dialog box, as shown in Figure 11-20. From here, you can select the SwitchMarkets macro and then click the Edit button.

Remember that when you recorded your macro, you selected the Southwest market from the Market field in both pivot tables. As you can see in Figure 11-21, the text "Southwest" is indeed hard-coded in the macro-generated code.

Figure 11-19: Use an INDEX formula to convert the index number output by the Combo Box to a textual value.



Figure 11-20: Select the Switch-Markets macro and click the Edit button.

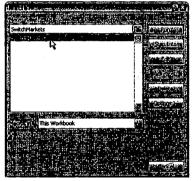
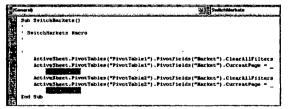


Figure 11-21: The Southwest market is hard-coded in the macro code.



8. Replace "Southwest" with ActiveSheet.Range("05").Value as demonstrated in Figure 11-22.

This tells the macro to get the market name from cell O5. After you've edited the macro, close the Visual Basic Editor to get back to the spreadsheet.

The final step is to ensure the macro plays each time you select a market from the Combo Box.

- 9. Right-click the Combo Box and select Assign Macro. Select the SwitchMarkets macro and then click OK.
- 10. (Optional) You can clean up the formatting on your newly-created report by hiding the rows and columns that hold the Filter fields in your pivot tables, plus any lists or formulas you don't want your audience to see.

As you can see in Figure 11-23, this setup provides an easy and reliable way to navigate pivot tables using one control.

Figure 11-22: Replace "Southwest" with ActiveSheet. Range("05"). Value.

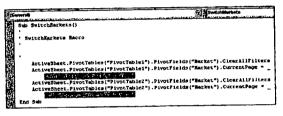


Figure 11-23: You can now navigate two pivot tables with just one Combo Boxl

	では、日本の日本の一体の大学を大き	THE PARTY OF THE P		
	SALE MAKE			
	Canada	(m)		
25			1	
133		U		Revenue
331	Sales Amount	蔡	87	
24		E 2003		
狨	Segment [7]	CH-1	Qtr2	QtrS
100	Accessories	\$3,672	\$7,467	\$25,618
390.	Silves	\$881,006	\$1,077,678	\$1,254,572
THE REP	Clothing	\$22,679	\$47,100	\$64,066
602	Components	\$101,663	\$219,122	\$435,844
23	Grand Total	\$1,009,221	\$1,351,567	\$1,779,839
				\$1,779,899 Volume To
	Grand Total	\$1,009,221	\$1,351,567	Volume To
		\$1,009,221	\$1,351,567	Volume To
	Grand Total Sum of OrderOr	\$1,009,221 T	\$1,351,567	Volume To
	Grand Total	\$1,009,221 T	\$1,351,567	Volume To
	Sum of OrderOr	\$1,009,221 (2) (2) (3)	\$1,351,567 Otr2	Volume To 1,135 1,576
	Grand Total Sum of OrderOr Segment Accessories	\$1,009,221	\$1,351,567 Otr2 410	Volume To 1,135 1,578 2,421
国国际国际区域	Grand Total Sum of OrderOf Segment Accessories Bles	\$1,009,229 21 9(d) 217 1,065	\$1,351,587 Otr2 410 1,348	Volume To 1,135 1,576
	Sum of OrderOf Segment Accessories Gikes Clothing	\$1,009,221 0tr1 217 1,065 765	01r2 410 1,348 1,553	Volume 1,135 1,576 2,421



You may notice your pivot table automatically adjusts the columns to fit the data each time you select a new market. This default behavior can be bothersome to someone using your pivot table reports. You can suppress this behavior by right-clicking each pivot table and selecting Table Options. This activates the PivotTable Options dialog box, where you can deselect the Autofit Column Widths On Update selection. Remember, you have to do this for each pivot table individually.

Using the List Box Control

The List Box control allows users to select from a list of predefined choices. The idea is that when an item from the List Box control is selected, some action is taken with that selection. To add a List Box to your worksheet, follow these steps:

- 1. Click the Insert drop-down list under the Developer tab.
- 2. Select the List Box Form control.
- Click the location in your spreadsheet where you want to place your List Box.
- After you drop the control onto your spreadsheet, right-click the control and select Format Control.
- Click the Control tab to see the configuration options, as shown in Figure 11-24.
- In the Input Range setting, identify the range that holds the predefined items you want to present as choices in the combo box.

As you can see in Figure 11-24, this List Box is filled with region selections.

7. Next, in the Cell Link box, enter the cell where you want the List Box to output its value.

By default, a List Box control outputs the index number of the selected item. This means if the second item on the list was selected, the number 2 would be output. If the fifth item on the list was selected, the number 5 would be output. Notice in Figure 11-24 that this particular control outputs to cell P2.

The Selection Type setting allows users to choose more than one selection in the List Box. The choices here are Single, Multi, and Extended.

Always leave this setting on Single, as Multi and Extended work only in the VBA (Visual Basic for Applications) environment.

- 8. (Optional) You can check the 3D property if you want the control to have a three-dimensional appearance.
- 9. Click OK to apply your changes.

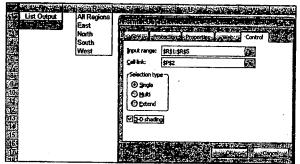
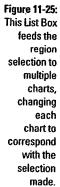
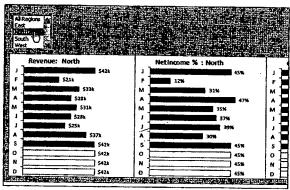


Figure 11-24: Formatting the List Box control.

List Box Example: Controlling Multiple Charts with One Selector

One of the more useful ways to use a List Box is to control multiple charts with one selector. Figure 11-25 illustrates an example of this. As a region selection is made in the List Box, all three charts are fed the data for that region, adjusting the charts to correspond with the selection made. Happily, all this is done without VBA code, just a handful of formulas and a List Box.





To create this example, I start with three raw datasets (as shown in Figure 11-26) that contain three categories of data; Revenues, Net Income %, and Gross Margin. Each dataset contains a separate line for each region.

I then add a List Box that outputs the index number of the selected item to cell P2. (See Figure 11-27.)

I then create a shadow dataset that will consist of all formulas. In this shadow dataset, I use the Excel's CHOOSE function to select the correct value from the raw data tables based on the selected region.



In Excel, the CHOOSE function returns a value from a specified list of values based on a specified position number. For instance, the formula CHOOSE(3, "Red", "Yellow", "Green", "Blue") returns Green because Green is the third item in the list of values. The formula CHOOSE(1, "Red", "Yellow", "Green", "Blue") returns Red.

See Chapter 14 to get a detailed look at the CHOOSE function.

As you can see in Figure 11-28, the CHOOSE formula retrieves the target position number from Cell P2 (the cell where the List Box outputs the index number of the selected item) and then matches that position number to the list of cell references given. The cell references come directly from the raw data table.

In the example shown in Figure 11-28, the data that would be returned with this CHOOSE formula would be 98741. Why? Because cell P2 contains the number 1, and the first cell reference within the CHOOSE formula is cell B7.

I entered the same type of CHOOSE formula into the Jan column and then copied it across. (See Figure 11-29.)

To test that your formulas are working, change the value of cell P2 manually, entering 1, 2, 3, 4, or 5. When the formulas work, all that's left to do is create the charts using the shadow data.

Figure 11-26:
Start with
the raw
datasets
that contain
one line per
region.

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-5	1						
	4.5	E-7	7.1	7-11-1		1.5	, e e e e
	All Regions	98,741	54,621	96,555	109,625		84.
B	East	27,474	22,674	35,472	36,292	31,491	27
123	North	41,767	20,806	32,633	28,023		27
	South	18,911	1,125	17,020	34,196	12,989	18.
d C	West	10,590	10,016	_ 11,430	11,115	12,357	10.
312.							
	The Course of		12.5	1. 19 H		. a.B.	
	All Regions	49.9%	50.6%	48.7%	47.8%		
615	East	63.1%	53.6%	55.8%	47.4%	41.5%	
46	North	45.3%	11.8%	31.0%	47.5%	35.2%	
Stor	South	31.2%	61,7%	41.8%	30.9%	9.0%	
	West	60.1%	75.4%	66.1%	65.2%	79.8%	
a) Sp							
20	والمعتق أرباء ومتهتني	- Fr. 1779 P. T.	7.7	117	1.0	100	7.79
$\mathcal{Z}_{\mathbb{Q}}$	All Regions	48,506	22,850	44,586	48,340		37.
72	East	17,326	12,154	19,799	17,206	13.079	11
2	North	18,914	2,455	10,115	13,299	10,938	10
(2)	South	5,904	694	7,115	10,582	1,171	7
0.5	West	6,364	7,547	7,557	7,253	9,867	8,
A						-,047	

Figure 11-27:
Add a List
Box and
note the cell
where the
output value
will be
placed.

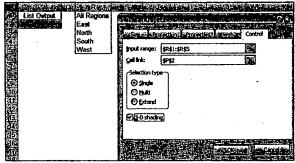


Figure 11-28:
Use the
CHOOSE
function to
capture the
correct data
corresponding to the
selected

region.

				List Output
1000	ar bet			
Tie 1	M Regions	98741	54,621	
67 E	ast	27474	22,674	
1569	lorth	41767	20,806	T
\$10.5	South	18911	1,125	
THV	Vest	10590	10,016	

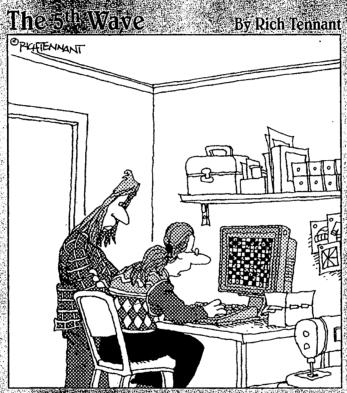
Create similar CHOOSE formulas for each row/ category of

Figure 11-29:

category of data and then copy the choose formulas across months.



Working with the Outside World



"I've used several spreadsheet programs, but this is the best one for designing quilt patterns."

In this part . . . he theme of this section is importing and exporting information to and from Excel. Chapter 12 explores some of the ways to incorporate data that doesn't originate in Excel. In that chapter, I show you how to import data from external sources as well as how to create systems that allow for the dynamic refreshing of external data sources. Chapter 13 wraps up this look on Excel dashboards and reports by showing you the various ways to distribute and present your work.

Chapter 12

Using External Data for Your Dashboards and Reports

In This Chapter

- ▶ Importing Microsoft Access data
- ▶ Importing Microsoft SQL Server data
- ▶ Using MS Query to get external data

ouldn't it be wonderful if every dataset you came across were neatly packed in one easy-to-use Excel table? Unfortunately, there are people (and you know who they are) who insist on using platforms other than Excel. Imagine the gall.

Of course, I'm being cheeky. The reality is that you will undoubtedly encounter situations when the data you need comes from external data sources. External data is exactly what it sounds like; data that isn't located in the Excel workbook in which you're operating. Some examples of external data sources are text files, Access tables, SQL Server tables, and even other Excel workbooks.

Throughout this book, I advocate the separation of data and presentation. When dealing with small datasets that are developed and maintained in Excel, you have to make a conscious effort to make that separation. However, in complex models where large volumes of data come from Access or SQL, the effort on your part is eliminated. That data is already separated, baby. The worry in these situations is how to efficiently move that data from over there to over here. This chapter explores the most efficient ways to get external data into Excel.

Before jumping in, however, there are a couple of disclaimers your humble author would like to throw out there. First, the focus of this chapter is on getting data from Access and SQL Server databases; mainly because the data for a typical Excel user resides in Access or SQL Server. Second, there are

numerous ways to get data into Excel. In fact, between the functionality found in the user interface and the VBA/code techniques, there are too many to focus on in one chapter. For this adventure, I focus on two techniques: using the Get External Data group and using MS Query. Why these two techniques? Both of these techniques are easy to grasp, can be implemented in most situations, and don't come with a lot of pitfalls and gotchas. Now that you can't sue me anymore, let's get started.

Using the Get External Data Group

Although the option to import external data was available in earlier versions of Excel, this functionality was buried several layers deep. In Excel.2007 however, Microsoft made importing Access data from the Excel user interface very simple — it's right on the Ribbon! Click the Data tab on the Ribbon to expose the Get External Data group, as shown in Figure 12-1.

Clicking any one of the data source types (each represented by an icon) activates an easy-to-use wizard that walks you through a process unique to that type. In this section, I walk through the process of importing both Access and SQL Server data using the Get External Data group.

Figure 12-1:
The Get
External
Data group
contains the
icons for
various
external
data
sources.



Importing Access data with the Get External Data Group

The process of importing Access data is unbelievably simple in Excel 2007. Here's what you do:

1. Select the Data tab from the Ribbon and select the From Access icon.

The first step is to browse for our Access database. If the database from which you wish to import is local, simply browse to the file location and

open it. If you have an Access database on a network drive at your employer, you may also select that database as well — provided you have the proper authorization and access.

2. Select the Access database from which you want to import and select Open. (See Figure 12-2.)

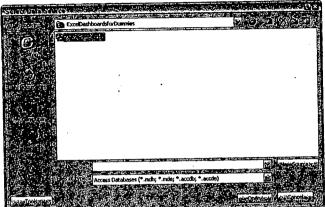


Figure 12-2: Select the target Access database.



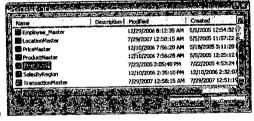
Note that you can import the older Access $\,$.mdb file formats as well as Access 2007 .accdb databases.

The Select Table dialog box appears. (See Figure 12-3.)

3. Choose an existing Access Table or Query.

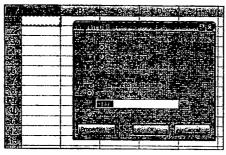
Note that both tables and queries are available for you to choose.

Figure 12-3: Select the needed table or query.



- 4. Choose the location and format for data that's to be imported. In the example in Figure 12-4, Table is chosen.
- 5. Click OK to start the import process.

Figure 12-4: Choose where and how you want your imported data.

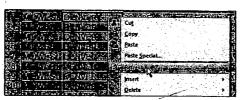




If you choose the Table option in the step shown in Figure 12-4, the raw data is written directly onto your spreadsheet. If you choose the PivotTable or PivotChart options, the data is saved to a pivot cache without writing the actual data to the spreadsheet. This allows your pivot table to function as normal without having to import potentially hundreds of thousands of data rows twice (once for the pivot cache and once for the spreadsheet). Feel free to review Chapter 3 for a quick explanation of pivot caches.

The incredibly powerful thing about data that has been imported this way is that it's refreshable! That's right. If you import data from Access using this technique, Excel creates a table that can be refreshed by right-clicking and selecting Refresh, as demonstrated in Figure 12-5. When you refresh your imported data, Excel goes out to the external data source and re-imports the data, overwriting the old table or pivot table.

Figure 12-5: Refresh your imported table by rightclicking inside the table.



Think about what this means in terms of building a reporting process. You can create a dashboard or report based on external data that can be refreshed when you need. When your data is refreshed, any charts, matrixes, conditional formatting, or pivot tables that are built on top of this data are automatically updated with the latest data. It's a beautiful thing.

Importing SQL Server data with the Get External Data menu

Although a few more steps are involved with importing SQL Server data in Excel, it's just as easy as importing Access data. Just follow these steps:

1. Select the Data tab from the Ribbon and click From Other Sources. Choose the From SQL Server option from drop-down list, as shown in Figure 12-6.

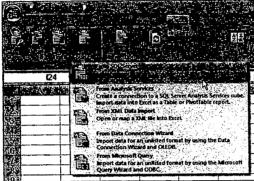
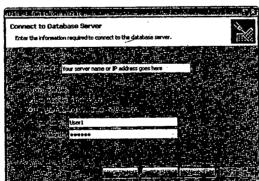


Figure 12-6: Select the From SQL Server option.

Selecting this option activates the Data Connection Wizard, as shown in Figure 12-7. The idea is to configure your connection settings from Excel to the server.

2. Enter the name of your server as well as your username and password.

Figure 12-7:
Step 1 of
the Data
Connection
Wizard is to
enter some
authentication
information.





If you're typically authenticated via Windows authentication, simply select the Use Windows Authentication option.

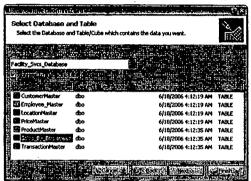
3. Select the database from which you want to import data.

As you can see in Figure 12-8, the Facility_Svcs_Database database has been selected.

After the database is selected, all tables and views in that database are displayed in the list of objects below the drop-down list.

4. Choose the table or view you want to analyze and then click the Next button.

Figure 12-8:
Specify the
database
you're using
and then
choose the
table or
view you
need to
import.



- In the next screen in the wizard, shown in Figure 12-9, you can enter some descriptive information about the connection you've just created.
- 6. When you're satisfied with your descriptive edits, click the Finish button to finalize your connection settings.

Note that all the fields in the screen shown in Figure 12-9 are optional. That is, if you bypass this screen without editing anything, your data imports just fine. The fields that are most often used on this screen are

- File Name: In the File Name input box, you can change the filename of the .odc (Office Data Connection) file generated to store the configuration information for the link you just created.
- Save Password in File: Under the File Name input box, you can save the password for your external data in the file itself (via the Save Password in File check box). Placing a check in this check box actually enters your password in the file. Keep in mind that

this password isn't encrypted, so anyone interested enough could potentially get the password for your data source simply by viewing your file with a text editor.

- Description: In the Description field, you can enter a plain description of what this particular data connection does.
- Friendly Name: The Friendly Name field allows you to specify your own name for the external source. You typically enter a name that's descriptive and easy to read.

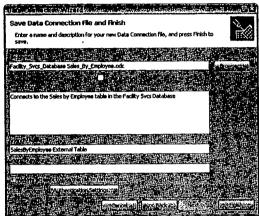


Figure 12-9: Add some descriptive information for your connection.

- 7. Choose the location and format for data that's to be imported. (See Figure 12-10.)
- 8. Click OK to start the import process.

Figure 12-10: Choose where and how you want your imported data.

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198	100	
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5 23		

Using the MS Query Wizard

Microsoft Query (affectionately known as MS Query) is a standalone program that, like the Get External Data option, establishes a refreshable data connection through the Excel user interface. The advantage in using MS Query is that you can manipulate the data you want to import. You can select records from Access objects subject to your own criteria or even user supplied criterial



MS Query may or may not be installed on your system, based on how you performed your Office installation. Keep in mind that if you don't have the MS Query program installed on your system, you can't link to external data sources in Excel. To install MS Query, you need your Microsoft Office installation disk. Start the Microsoft Office Setup and choose to customize your installation. While you're customizing your installation, look for Office Tools. Find the Microsoft Query under Office Tools entry. Make sure you set it to Run from My Computer and then complete the installation.

You can find the MS Query option under the From Other Sources drop-down list, as shown in Figure 12-11. To import data using the MS Query Wizard, follow these steps:

1. Select the From Microsoft Query option.

After MS Query fires up, you see the Choose Data Source dialog box, as shown in Figure 12-12.



In this walkthrough, source some data from the ZalexCorp.accdb Access database. This file can be found on this book's companion Web site.

2. Choose <New Data Source> from the Databases tab and click OK.

The Create New Data Source dialog box appears.

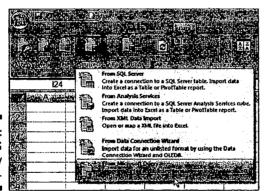


Figure 12-11: Start the MS Query Wizard.

- 3. Type a name for your data source at the top of the dialog box. As you can see in Figure 12-13, I call it ZalexCorp.
- 4. Choose a type of driver for the database to which you wish to connect. In this walkthrough, I select Microsoft Access Driver (*.mdb, *.accdb), as shown in Figure 12-14.
- 5. Click the Connect button to activate the ODBC Microsoft Access Setup dialog box.

Figure 12-12:
The MS
Query
Wizard
starts by
asking you
to choose
your data
source.

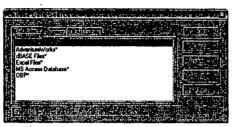


Figure 12-13: Name your new data source.

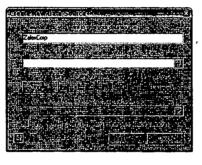
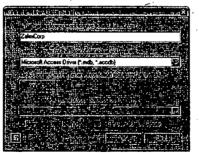


Figure 12-14: Choose the Access database driver.



6. Click the Select button.

The Select Database dialog box appears.

- 7. Navigate to the Access database (see Figure 12-15), select it, and click OK.
- 8. After you select your database, continue to press OK until you come back to the Choose Data Source dialog box.

As Figure 12-16 illustrates, your newly-linked ZalexCorp database is now displayed in list of data sources. After a database appears in the data sources list, you no longer have to perform Steps 2-8 to access it. You can simply click the name (in this case ZalexCorp) and connect directly. This is somewhat like setting a bookmark to a Web site.

Figure 12-15: Select the database to which you're connecting.

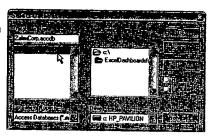
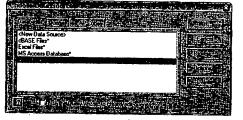


Figure 12-16: ZalexCorp is now in the list of databases.



- 9. Select ZalexCorp and click OK to display a list of tables and queries available within the ZalexCorp database.
- 10. Pull the fields you want into your query. To do this, click the expand icon to the left of your chosen table name (see Figure 12-17). Then select each field and click the right-facing arrow to move the field into the Columns in Your Query box.



A quick way to choose all the fields in a table is to select the table (without expanding it) and then click the arrow to move the fields in this table over to the Columns in Your Query box.

11. If you wish to change field ordering after you select your fields, you can use the up and down arrows to the right of the Columns in Your Query box.



By default, the MS Query Wizard arranges the fields in the order in which you choose them. Changing the order of fields is something you can't do with the Get External Data functionality.



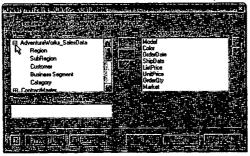
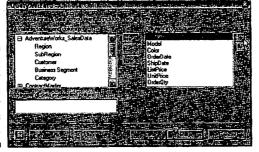


Figure 12-18: MS Query actually lets you reorder the fields you select.



The next pane of the MS Query Wizard gives you options to apply your own criteria to filter your data before importing. (See Figure 12-19.)

To activate a filter, select the field you wish to filter from the Column to Filter box on the left. Doing so activates the filter options on the right side of the wizard. The first field allows you to select a condition from a drop-down list (such as Equals, Does Not Equal, or Greater Than or Equal To). The second field allows you to specify criteria for this condition. This section of the wizard allows you to combine up to three filters with and/or logical operators. Again, applying filters on the fly is something you can't do with the Get External Data functionality.

12. Apply a filter to include only those records that have a UnitPrice greater than 200 and then click Next.

The next pane of the Query Wizard allows you to provide a custom sort to your data. In this pane, you can apply only three consecutive sorts. (See Figure 12-20.)

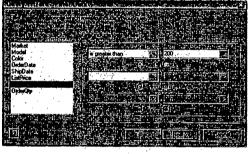
13. Apply a sort on Market in Ascending order and then click Next.

You're almost done. The next pane asks whether you wish to return the data to Excel or further modify the query in MS Query. (See Figure 12-21.) Also note the Save Query button. With this button, you can save your query so you can access it from the Queries tab of the Choose Data Source dialog box. In this example, don't save your query and instead choose to view your data in Excel.

- 14. Select the Return Data to Microsoft Office Excel option and then click Finish.
- 15. Choose the location and format for data that's to be imported (see Figure 12-22) and then click OK to start the import process.

As with tables created with the Get External Data functionality, data imported using MS Query is refreshable! You can refresh the data by right-clicking inside the table and selecting Refresh. When you refresh your imported data, Excel goes out to the external data source and re-imports the existing data.

Figure 12-19: **MS Query** lets you apply criteria to filter data before importing.





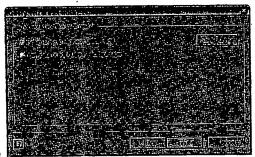
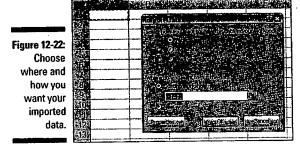


Figure 12-21: Choose to return data to Excel.



Managing External Data Properties

External data tables have a few adjustable properties that are exposed via the Properties dialog box. You can get to the properties of a particular External data table by clicking the target table and selecting the Properties icon under the Data tab. (See Figure 12-23.)

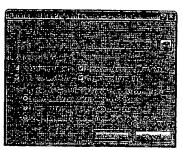
Figure 12-23: Getting to the properties of an external data table.



Activating the properties of an external data table calls up the External Data Properties dialog box, as shown in Figure 12-24. Take a moment to understand what each of these properties does. They are as follows:

- Include Row Numbers: This property is unchecked by default. Checking this property creates a dummy column that contains row numbers. The first column of your dataset is this row number column upon refresh.
- Adjust Column Width: This property is checked by default, telling Excel to adjust the column widths each time the data is refreshed. Removing this check causes the column widths to remain the same.
- Preserve Column/Sort/Filter/Layout: If this is checked, the order of the columns and rows of the Excel range remains unchanged. This way, you can rearrange and sort the columns and rows of the external data in your spreadsheet without worrying about blowing away your formatting each time you refresh.
- Preserve Cell Formatting: This is checked by default, telling Excel to keep the applied cell formatting when you refresh.
- Insert cells for New Data, Delete Unused Cells: This is the default setting for data range changes. When data rows decrease, you may have errors in adjacent cells that reference your external range. The cells these formulas referenced are deleted, so when you reference them you get a #VALUE error in your formula cells.
- Insert Rows for New Data, Clear Unused Cells: This option ensures that unused cells are not deleted, but only cleared when refreshing your data source. This is handy when you have formulas that reference the cells within your query results. When the unused cells are cleared instead of deleted, formulas that reference those cells retain the their reference addresses instead of returning #Ref errors.
- Overwrite Existing Cells with New Data, Clear Unused Cells: The third option should be the same as option two when rows decrease as unused cells are cleared.

Figure 12-24: The External **Properties** dialog box.



Chapter 13

Sharing Your Work with the Outside World

In This Chapter

- ▶ Safeguarding your dashboards and reports
- ▶ Displaying your dashboards in PowerPoint
- ➤ Saving your dashboards and reports to PDF

et's face it; you're not making these dashboards and reports for your amusement. At some point, you'll want to share your handiwork with others. The focus of this chapter is preparing your dashboards for life outside your PC. Here, explore the various methods of protecting your work from accidental and purposeful meddling and discover how you can distribute your dashboards via PowerPoint and PDF (Portable Document Format).

Protecting Your Dashboards and Reports

You've put in a ton of hours getting your dashboard and reports to work the way you want them to. The last thing you need is to have a clumsy client or an overzealous power-user botching up your Excel file.

Before distributing any Excel-based work, you should always consider protecting your file by using the protection capabilities native to Excel. Although none of Excel's protection methods are hacker-proof, they do serve to protect the formulas, data structures, and other objects that make your reporting mechanisms tick.

Securing the entire workbook using file protection options

Perhaps the best way to protect your Excel file is to employ Excel's file protection options. These options enable you to apply protection at the workbook level, requiring a password to view or make changes to the file. This method is by far the easiest to apply and manage. With this method, there's no need to protect each worksheet one at a time. You can simply apply a blanket protection to guard against unauthorized access and edits. Take a moment to review the File Sharing options, which are as follows:

- Forcing Read Only mode unless a password is given
- Requiring a password to open an Excel file
- Removing workbook level protection

The next few sections discuss these options in detail.

Forcing Read Only mode unless a password is given

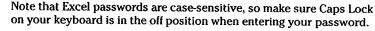
You can force your workbook to go into Read Only mode unless the user has the appropriate password. This way you can keep your file safe from unauthorized changes, yet still allow authorized users to edit the file.

Here are the steps to force Read Only mode:

- 1. Open an existing Excel file and click the Office icon in the upper-left corner.
- 2. Select Save As to activate the Save As dialog box.
- 3. In the Save As dialog box, click the Tools button and select General Options, as demonstrated in Figure 13-1.

The General Options dialog box appears.

4. Enter an appropriate password in the Password to Modify input box (as illustrated in Figure 13-2) and click OK.



- 5. Excel asks you to reenter your password, so reenter your chosen password.
- 6. Save your file to a new name.

At this point, your file is password-protected from unauthorized changes. If you were to open your file, you'd see something similar to Figure 13-3. Failing to enter the correct password causes the file to go into Read Only mode.



Figure 13-1:
The File
Sharing
options are
well hidden
in the Save
As dialog
box under
General
Options.

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Figure 13-2: Enter the password needed to modify the file.



Figure 13-3:
A password
is now
needed to
make
changes to
the file.



Requiring a password to open an Excel file

You may have instances where your Excel dashboards are so sensitive only certain users are authorized to see them. In these cases, you can force your workbook to require a password to open. Here are the steps to employ a password to open the file.

- 1. Open an existing Excel file and click the Office icon in the upper-left corner.
- 2. Select Save As to activate the Save As dialog box.
- 3. In the Save As dialog box, click the Tools button and select General Options. (Refer to Figure 13-1.)

The General Options dialog box opens.

- 4. Enter an appropriate password in the Password to Open input box (as illustrated in Figure 13-4) and click OK.
- 5. Excel asks you to reenter your password.
- 6. Save your file to a new name.

At this point, your file is password-protected from unauthorized viewing.

Figure 13-4: Enter the password needed to modify the file.



Removing workbook level protection

Removing workbook level protection is as easy as clearing the passwords from the General Options dialog box. Here's how you do it:

- Open an existing Excel file and click the Office icon in the upper-left corner.
- 2. Select Save As to activate the Save As dialog box.
- 3. In the Save As dialog box, click the Tools button and select General Options. (Refer to Figure 13-1.)

The General Options dialog box opens.

- Clear the Password to Open input box as well as the Password to Modify input box and click OK.
- 5. Save your file.



Notice the Read-Only Recommended check box in the General Options dialog box (refer to Figure 13-4). When you place a check in this check box, you get a cute but useless message recommending read-only mode upon opening the file. This message is only a recommendation and does not prevent anyone from opening the file as read/write.

Protecting worksheets

You may find that you need to apply protection to specific worksheets, preventing users from taking certain actions. For example, you may not want

users to break your data model by inserting or deleting columns and rows. You can prevent this by applying protection to your worksheet.

Unlocking editable ranges

By default, all cells in a worksheet are set to be locked when you apply worksheet level protection. That is to say, after you protect a worksheet, the cells on that worksheet can't be altered in any way. That being said, you may find you need certain cells or ranges to be editable even in a locked state, like the example shown in Figure 13-5.

- 1. Select the cells you need to unlock.
- 2. Right-click and choose Format Cells.
- 3. On the Protection tab, as shown in Figure 13-6, deselect the Locked property.

Figure 13-5: Though this sheet needs to be protected, users will need to enter 2006 data into the input cells provided.

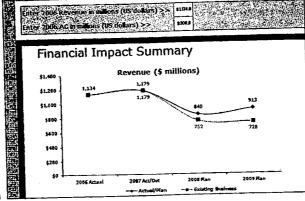
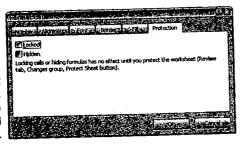


Figure 13-6:
To ensure a cell remains unlocked when the worksheet is protected, deselect the Locked property.



4. Click OK to apply the change.

Applying worksheet protection

After you've selectively unlocked the necessary cells, you can commence to applying worksheet protection. Just follow these steps:

1. Click the Protect Sheet button on the Review tab of the Ribbon (see Figure 13-7) to activate the Protect Sheet dialog box.

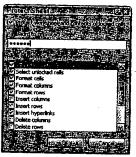
Figure 13-7: Click Protect Sheet in the Review tab.



2. Enter a password in the given input box, as demonstrated in Figure 13-8, then click the OK button.

This is the password that removes worksheet protection. Note that specifying a password is optional, as you can apply and remove worksheet protection without one.

Figure 13-8:
Specify a password that removes worksheet protection.



In the list below the password input (see Figure 13-8), specify which elements users are allowed to change when you protect the worksheet.

When a check box is cleared for a particular action, Excel prevents users from taking that action.

Take a moment to familiarize yourself with the some of the actions you can limit when protecting a worksheet. They are as follows:

Select Locked Cells: Allows or prevents the selection of locked cells.

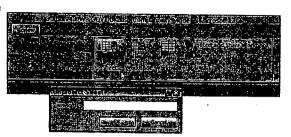
- Select Unlocked Cells: Allows or prevents the selection of unlocked cells.
- Format Cells: Allows or prevents the formatting of cells.
- Format Columns: Allows or prevents the use of column formatting commands, including changing column width or hiding columns.
- Format Rows: Allows or prevents the use of row formatting commands, including changing row height or hiding rows.
- Insert Columns: Allows or prevents the inserting of columns.
- Insert Rows: Allows or prevents the inserting of rows.
- Insert Hyperlinks: Allows or prevents the inserting of hyperlinks.
- Delete Columns: Allows or prevents the deleting of columns. Note that if Delete Columns is protected and Insert Columns is not protected, you can technically insert columns you can't delete.
- Delete Rows: Allows or prevents the deleting of rows. Note that if Delete Rows is protected and Insert Rows is not protected, you can technically insert columns you can't delete.
- Sort: Allows or prevents the use of Sort commands. Note that this
 doesn't apply to locked ranges. Users can't sort ranges that contain
 locked cells on a protected worksheet, regardless of this setting.
- Use AutoFilter: Allows or prevents use of Excel's AutoFilter functionality. Users can't create or remove AutoFiltered ranges on a protected worksheet, regardless of this setting.
- Use PivotTable Reports: Allows or prevents the modifying, refreshing, or formatting of pivot tables found on the protected sheet.
- Edit Objects: Allows or prevents the formatting and altering of shapes, charts, text boxes, controls, or other graphics objects.
- Edit Scenario: Allows or prevents the viewing of scenarios.
- 4. If you provided a password, reenter the password.
- 5. Click OK to apply the worksheet protection.

Removing worksheet protection

Just follow these steps to remove any worksheet protection you may have applied:

- 1. Click the Unprotect Sheet button on the Review tab.
- 2. If you specified a password while protecting the worksheet, Excel asks you for that password (see Figure 13-9). Enter the password and click OK to immediately remove protection.

Figure 13-9:
The
Unprotect
Sheet
button
removes
worksheet
protection.



Protecting the workbook structure

If you look under the Review tab in the Ribbon, you see the Protect Workbook button next to the Protect Sheet button. Protecting the workbook enables you to prevent users from taking any action that affects the structure of your workbook, such as adding/deleting worksheets, hiding/unhiding worksheets, and naming or moving worksheets. Just follow these steps to protect a workbook:

 Click the Protect Workbook button on the Review tab of the Ribbon to activate the Protect Structure and Windows dialog box, as shown in Figure 13-10.

Figure 13-10: The Protect Structure and Windows dialog box.



2. Choose which elements you want to protect: workbook structure, windows, or both.

When a check box is cleared for a particular action, Excel prevents users from taking that action.

Selecting Structure prevents users from

- Viewing worksheets that you've hidden
- · Moving, deleting, hiding, or changing the names of worksheets
- · Inserting new worksheets or chart sheets
- Moving or copying worksheets to another workbook

- Displaying the source data for a cell in a pivot table Data area or displaying pivot table Page field pages on separate worksheets
- Creating a scenario summary report
- Using any Analysis Toolpak utilities that require results to be placed on a new worksheet
- · Recording new macros

Choosing Windows prevents users from changing, moving, or sizing the workbook windows while the workbook is opened.

- 3. If you provided a password, reenter the password.
- 4. Click OK to apply the worksheet protection.

Linking Your Excel Dashboards into PowerPoint

There are at least eight different methods to get Excel data into PowerPoint. For our purposes, I'll focus on the method that is most conducive to presenting frequently updated dashboards and reports in PowerPoint — creating a dynamic link. A dynamic link allows your PowerPoint presentation to automatically pick up changes you make to your Excel files.

Creating the link between Excel and PowerPoint

When you copy and paste a range of data, you're simply creating a picture of the range. However, when you create a link to a range, PowerPoint stores the location information to your source field and then displays a representation of the linked data. The net effect is that when the data in your source file changes, PowerPoint updates its representation of the data to reflect the changes.

To test this concept of linking to an Excel range, follow these steps:

- Open the Chapter 13 Sample File.xlsx file.
 This file is available on this book's companion Web site.
- 2. Click the chart once to select it and press Ctrl+C on your keyboard to copy the chart.



If you're copying multiple charts, you don't have to copy one at a time. Simply select the range of cells that contain the charts and press Ctrl+C to copy. This way, you're copying everything in that range of cells charts and all.

- 3. Open a new PowerPoint document and place your cursor at the location you want the linked table to be displayed.
- 4. On the Home tab in PowerPoint, choose Paste⇒Paste Special, as demonstrated in Figure 13-11.

The Paste Special dialog box appears. (See Figure 13-12.)

5. Select the Paste Link radio button and choose Microsoft Excel Chart Object from the list of document types.

Select Paste Special from the home tab in PowerPoint.

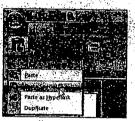
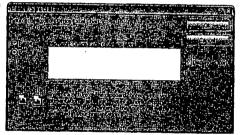


Figure 13-12: Be sure to select Paste Link and set the link as an Excel Chart Object.



6. Click OK to apply the link.

At this point, you have a chart on your PowerPoint presentation that's linked back to your Excel file. (See Figure 13-13.)



This technique of linking Excel charts to PowerPoint is ideal if you aren't proficient at building charts in PowerPoint. Build the chart in Excel and then simply create a link for the chart in PowerPoint.





Manually refreshing links to capture updates

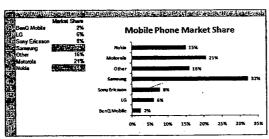
The wonderful thing about dynamic links is they can be refreshed, enabling you to capture any updates in your Excel files without recreating the links. To see how this works, follow these steps:

1. Go back to your Excel file (from the example in the previous section) and change the values for Samsung and Nokia, as demonstrated in Figure 13-14.

Note the chart has changed.

Figure 13-14: With a linked chart,

linked chart,
you can
make
changes to
the raw data
without
worrying
about reexporting
the data into
PowerPoint.



2. Return to PowerPoint, right-click the chart link in your presentation and choose Update Link, as demonstrated in Figure 13-15.

You see that your linked chart automatically captures the changes.

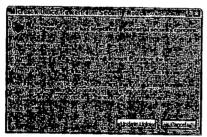
Cut
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Figure 13-15: You can manually update links.

3. Save and close both your Excel file and your PowerPoint presentation, and then open only your newly-created PowerPoint presentation.

This time you see the message shown in Figure 13-16. Clicking the Update Links button refreshes all links in the PowerPoint presentation. Each time you open any PowerPoint presentation with links, it asks you whether you want to update the links.

Figure 13-16: PowerPoint, by default, asks if you want to update all links in the presentation.



Automatically refreshing links to capture updates

Having PowerPoint ask you whether you want to update the links each and every time you open your presentation quickly gets annoying. You can avoid this message by specifying that PowerPoint automatically refresh your dynamic links upon opening the file. Here's how:

- 1. In PowerPoint, click the Office icon in the upper-left corner.
- 2. Select the Prepare option and then click Edit Links to Files, as shown in Figure 13-17.

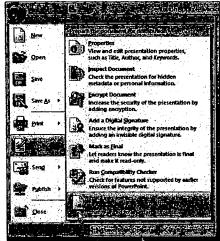


Figure 13-17: Open the dialog box to manage your links.

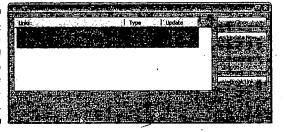
The Links dialog box appears. (See Figure 13-18.)

3. Click each of your links and select the Automatic radio button.



To select multiple links in the Links dialog box, hold down the Ctrl key on your keyboard while you select your links.

Figure 13-18: Setting the selected links to update automatically.



When your links are set to update automatically, PowerPoint automatically synchronizes with your Excel file and ensures that all your updates are displayed.

Distributing Your Dashboards via PDF

In Excel 2007, Microsoft has made it possible to convert your Excel Worksheets to PDF (Portable Document Format) or XPS (XML Paper Specification). PDF is the standard document sharing format developed by Adobe. XPS is Microsoft's own open-source competitor to Adobe's PDF file format. Distributing your reports and dashboards as PDF or XPS documents allows you to share your work without sharing your entire workbook.

Due to some legal complications, Microsoft was unable to include the "convert to PDF" functionally natively to Excel. That is, you won't find that option in Excel by default. You'll have to install Microsoft's free utility to convert your work to PDF.

To install this utility, follow these steps:

- 1. Click on the Office icon in the upper-left corner of Excel
- 2. Select Save As, then choose Find Add-Ins for Other File Formats.

 A Help file opens.
- 3. In the Help file, select the Install and Use the Publish as PDF or XPS Add-in from Microsoft option.
- Click on the link to go to the Web site for the Microsoft Save as PDF or XPS Add-in.
- When asked for software validation and installation of the Genuine Advantage plug-in, click Continue.

This is Microsoft's piracy protection check.

- After the Genuine Advantage plug-in has done its check, click the Download button to download the Save as PDF or XPS Add-in. Keep a note of where the file is downloaded.
- 7. Double-click on the downloaded file, accept the user agreement that displays, and follow the installation steps.

The reward for all your work is a new menu selection in Excel's Save As menu. After you have this selection, you can convert a worksheet to PDF or XPS by clicking on the Office Icon, selecting Save As, and then choosing PDF or XPS.

Part William The Part of Tens



"Nifty chart, Frank, but not entirely necessary.

In this part . . . Both of the chapters found in this section offer approximately ten pearls of wisdom, delivered in bite-sized pieces. In Chapter 14, I share with you ten (or so) best practices for chart building, helping you to design more effective charts. In Chapter 15, I provide a checklist of questions you should ask yourself before sharing your Excel dashboards and reports.

Chapter 14

Ten Chart Design Principles

In This Chapter

- ➤ Avoiding fancy formatting
- ➤ Skipping unnecessary chart junk
- ▶ Formatting large numbers
- ▶ Using data tables instead of data labels
- ▶ Using chart titles effectively
- ▶ Sorting data before charting
- ▶ Limiting the use of pie charts
- ▶ Parsing data into separate charts
- ► Maintaining correct aspect ratios
- ► Knowing when not to use charts

I'm the first to admit, I've created my share of poorly-designed charts — bar charts with every color known to man, line charts with ten or more lines slapped on top of each other, and pie charts with slices so thin they melded into a blob of black ink. When I look at these early disasters, my look of shame is similar to that of a baby boomer looking at pictures of himself in white bell-bottom jeans.

Excel makes charting so simple, it's often tempting to accept the charts it creates no matter how bad the default colors or settings are. But I'm here to implore you to turn away from the glitzy lure of the default settings. You can easily avoid charting fiascos by following a few basic design principles.

In this chapter, I share with you a few of these principles and help you avoid some of the mistakes I've made in the past. (No thanks needed.)

Avoid Fancy Formatting

One of Microsoft's major selling points of Excel 2007 is the new graphics engine that occupies the new Office suite. Excel 2007 makes it easy to apply effects that make everything look shiny, glittery, and oh-so-pretty. Now don't get me wrong, these new graphics are more-than-okay for charts created for sales and marketing presentations. However, when it comes to dashboards, you definitely want to stay away from them.

Remember that a *dashboard* is a platform to present your case with data. Why dress up your data with superfluous formatting when the data itself is the thing you want to get across? It's like making a speech in a Roman general's uniform. How well will you get your point across when your audience is thinking, "What's the deal with Tiberius?"

Take Figure 14-1, for instance. I created this chart (formatting and all) with just a few clicks. Excel makes it super easy to achieve these types of effects with its new Layout and Style features. The problem is that these effects subdue the very data you're trying to present. Furthermore, if you include this chart on a page with five to ten other charts with the same formatting, you get a blinding mess that's difficult to look at, much less read.

The key to communicating effectively with your charts is to present your data as simply as possible. I promise you, your data is interesting on its own. There's no need to wrap it in eye candy to make it more interesting.

Figure 14-2 shows the same data without the fancy formatting. I think you'll find that not only is the chart easier to read, but you can process the data more effectively from this chart.

Here are some simple tips to keep from overdoing the fancy factor:

- ✓ Don't apply background colors to the Chart or Plot area. Colors in general should be reserved for key data points in your chart.
- Don't use 3D charts or 3D effects. No one's going to give you an Oscar for special effects. Anything 3D doesn't belong on a dashboard.
- Avoid applying fancy effects, such as gradients, pattern fills, shadows, glow, soft edges, and other formatting. Again, the word of the day is focus, as in "focus on the data and not the shiny happy graphics."
- Don't try to enhance your charts with clip art or pictures. Not only do they do nothing to further data presentation, but they often just look tacky.

Figure 14-1: **Fancy** formatting can be overwhelming, subduing the very data you're trying to present.

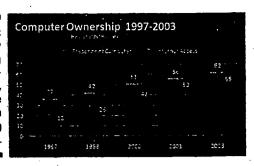
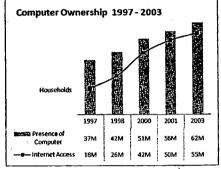


Figure 14-2: Charts should present your data as simply as possible.



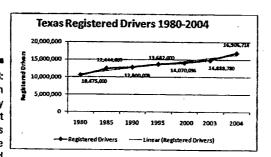
Skip the Unnecessary Chart Junk

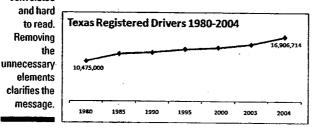
Data visualization pioneer Edward Tufte introduced the notion of data to ink ratio. Tufte's basic idea is that a large percentage of the ink on your chart or dashboard should be dedicated to data. Very little ink should be used to present what he calls chart junk: borders, gridlines, trend lines, labels, backgrounds, and so on.

Figure 14-3 illustrates the impact chart junk can have on your ability to communicate your data. At first glance, the top chart in Figure 14-3 may look over-exaggerated in its ambition to show many chart elements at one time, but believe me, there are charts out there that look like this. Notice how convoluted and cramped the data looks.

The bottom chart presents the same information as the top chart. However, the bottom chart more effectively presents the core message that driver registrations in Texas rose from 10+ million to almost 17+ million (a message that was somehow diluted in the top chart). You can see from this simple example how a chart can be dramatically improved by simply removing the elements that don't directly contribute to the core message of the chart.

Figure 14-3:
Charts with
too many
chart
elements
can become
convoluted
and hard
to read.
Removing





Here are a few ways to avoid chart junk and ensure your charts clearly present your data:

- ✓ Remove gridlines: Gridlines (both vertical and horizontal) are almost always unnecessary. The implied reason for gridlines is that they help to visually gauge the value represented by each data point. The truth is, however, we typically gauge the value of a data point by comparing its position to the other data points in the chart. So gridlines become secondary reference points that simply take up ink.
- ✓ Remove borders: You'll find that eliminating borders and frames gives your charts a cleaner look and helps avoid the dizzying lines you get when placing many charts with borders on a single dashboard. Instead of borders, space your charts to make use of the white space between the charts as implied borders.
- ✓ Skip the trend lines: Seldom does a trend line provide insight that can't be gained with the already plotted data or a simple label. In fact, trend lines often state the obvious and sometimes confuse readers into thinking they're another data series. Why place a trend line on a line chart when the line chart is in and of itself a trend line of sorts? Why place a trend line on a bar chart when it's just as easy to look at the top of the bars? In lieu of trend lines, add a simple label that states what you're trying to say about the overall trend of the data.
- Avoid data label overload: Nothing says you need to show the data label for every value on your chart. It's okay to plot a data point but not display its value. You'll find that your charts have more impact when

you show only numbers that are relevant to your message. For example, Figure 14-3 shows a trend that includes seven years of data. Although all the years are plotted to show the trend, only values of the first and last plotted years are shown. The first and last plotted year's data is enough to fulfill the purpose of this chart, which is to show the trend and ultimate growth of driver registrations.

- ✓ Don't show a legend if you don't have to: When you're plotting one data series, there's no need to display a space-taking chart legend. If you allow your chart title to identify the one data series in your chart, you can simply delete the legend.
- PRemove any axis that doesn't provide value: The purpose of the x- and y-axes are to help a user visually gauge and position the values represented by each data point. However, if the nature and utility of the chart doesn't require a particular axis, you should remove it. In Figure 14-3, there's no real need for the y-axis because the two data points I'm trying to draw attention to are labeled already. Again, the goal here isn't to hack away at your chart. The goal is to only include those chart elements that directly contribute to the core message of your chart.

Format Large Numbers Where Possible

It's never fun to count the zeros in a large number, especially when you're staring at 8-pitch font. When plotting very large numbers on a chart, consider formatting the values so that they're truncated for easy reading.

For instance, in Figure 14-4, I've formatted the values to be displayed as 10M and 17M instead of the hard-to-read 10,475,000 and 16,906,714.

You can easily format large numbers in Excel by using the Format Cells dialog box. Here, you can specify a custom number format by selecting Custom in the Category list and entering the desired number format code in the Type input box. If Figure 14-5, the code "0,,"M" ensures the numbers are formatted to millions with an Mappendage.

Figure 14-4: Formatting large numbers to millions or thousands makes for a clearer chart.

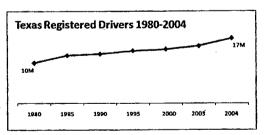
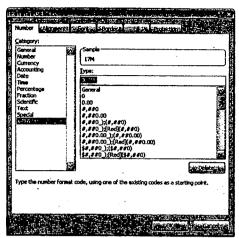


Figure 14-5:
Select
Custom
in the
Category list
and enter a
number
format code
in the Type
input box.





To get to the Format Cells dialog box, highlight the numbers you're formatting, right-click, and then choose Format Cells.

It's generally good practice to format the source data that feeds your chart as opposed to the data labels on your chart. This way, your formatting persists even as you add and remove data labels.



In Chapter 1, you will find a table under the section "A Quick Look at Dashboard Design Principles" which lists some common format codes and how they can affect your numbers.

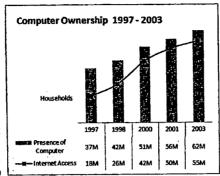
Use Data Tables instead of Data Labels

There may be situations where it's valuable to show all the data values along with the plotted data points. However, you've already seen how data labels can inundate your users with chart junk.

Instead of using data labels, you can attach a data table to your Excel chart. A *data table* allows you to see the data values for each plotted data point, beneath the chart. Figure 14-6 illustrates a data table, showing the data values for two series. As you can see, a lot of information is shown here without overcrowding the chart itself.

Although it is true that data tables increase the space your charts take up on your dashboard, they respond well to formatting and can be made to meld nicely into your charts. Data tables come in particularly handy if your clients are constantly asking to see the detailed information behind your charts.

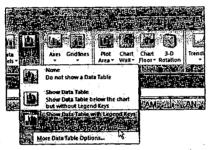
Figure 14-6:
Data tables
enable you
to show
data values
without
overloading
your chart
with data
labels.



Here are the steps you take to add a data table to your chart:

- 1. Click your chart and select the Layout tab.
- 2. Click the Data Table icon and select Show Data Table with Legend Keys, as demonstrated in Figure 14-7.

Figure 14-7: Adding a data table to a chart.



3. Right-click your newly-added data table and choose Format Data Table.

The Format Data Table dialog box appears. (See Figure 14-8.)

4. Apply any additional formatting to your data table.

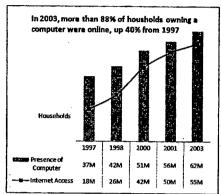
Figure 14-8: The Format Data Table dialog box.

Rical (01) il di dili	7/2
	Data Table Options
Fil .	Table Borders
Border Color	2 Horizontal
Border Styles	Cruci 12 yerson
Stradow	122.1
3-D Formet	☑ Quine
	☑ Show legend keys

Make Effective Use of Chart Titles

Chart titles don't have to be limited to simple labeling and naming duties. You can use chart titles to add an extra layer of information, presenting analysis derived from the data presented in the chart. Figure 14-9 demonstrates this.

Figure 14-9:
Use chart
labels to
present an
extra layer
of data
without
taking up
extra space
on your
dashboard.

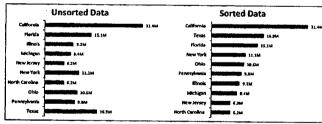


Sort Your Data before Charting

Unless there's an obvious natural order, such as age or time, it's generally good practice to sort your data when charting. By *sorting*, I mean sort the source data that feeds your chart in Ascending or Descending order by data value.

As you can see in Figure 14-10, building a chart using a dataset sorted by values enhances its readability and somehow gives the chart a professional look and feel.

Figure 14-10: Using sorted data in a chart improves readability and clarity.



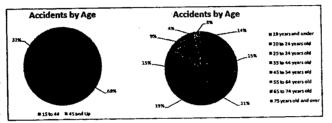
Limit the Use of Pie Charts

Although pie charts have long been considered a viable charting option for business reporting, they often aren't well suited for dashboard reporting. There are several reasons for this.

First, they typically take up more space than their cousins, the line and bar charts. Sure, you can make them small, but pixel for pixel, you get a lot less bang for your data visualization buck with a pie chart.

Second, pie charts can't clearly represent more than two or three data categories. Figure 14-11 demonstrates this fact.

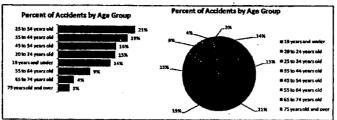
Figure 14-11:
Pie charts
can't clearly
represent
more than
two or
three data
categories.



The pie chart on the left does a good job visually representing two data categories. You can easily distinguish the two categories and clearly get a sense of distribution for each category. The pie chart on the right is a different story. As you can see, when you go past two or three categories, a pie chart isn't as effective in relaying the proper sense of percent distribution. The slices are too similar in size and shape to visually compare the categories. Plus, the legend and data categories are disconnected, causing your eyes to jump back and forth from pie to legend (even in color this the legend doesn't help). Sure, you could add category labels, but that would cause the chart to take up more real estate without adding much value.

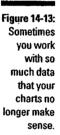
So what's the alternative? Instead of a pie chart, consider using a bar chart. With a bar chart, you can clearly represent the distribution percentages for many categories without taking the need for extra real estate. In Figure 14-12, you can see the dramatic improvement in clarity you can achieve by using bar charts.

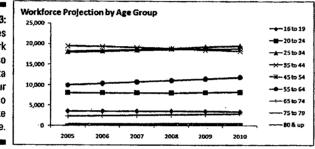




Don't Be Afraid to Parse Data into Separate Charts

Be aware that a single chart can lose its effectiveness if you try to plot too much data into it. Take Figure 14-13, for example.



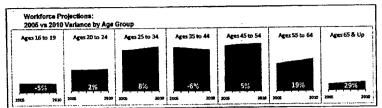


You have a couple of problems here. First, the data is split into nine age groups, which forces the use of nine lines. When you start plotting more than three lines on a line chart, your chart begins to look jumbled. Second, the age groups themselves have a wide range of data values. This causes the chart's y-axis scale to be so spread that each line essentially looks like a straight line.

In situations like this, step back and try to boil down what exactly the chart needs to do. What is the ultimate purpose of the chart? In this case, the ultimate purpose of this chart is to show the growth or decline of the workforce numbers for each age group. Now, you obviously can't show every data point on the same chart, so you have to show each age group in its own chart. That being said, you want to make sure that you can see each age group alongside the other for comparison purposes.

Figure 14-14 shows just one of many solutions for this particular example.

Figure 14-14:
Creating
separate
individual
charts is
often better
than one
convoluted
chart.



Here, I've created a separate area chart for each age group and then lined them up side by side. Each chart individually shows a general trend from 2005 to 2010. Because they're placed together, you can get an idea of the magnitude of each age group. Also, notice that I grouped the last three age groups into one group called 65 & Up. This groups the three smallest categories into one that's worthy of plotting. Finally, I used data labels to quickly show the growth or decline percentage from 2005 to 2110 for each group.

Again, this isn't the only solution to this problem, but it does do the job of displaying the analysis I chose to present.

It's not always easy to know exactly how to display your data in a chart—especially when the data is multi-layered and complex. Instead of jamming the world into one chart, step back and think about how to show the data separately, but together.

Maintain Appropriate Aspect Ratios

In terms of charts, aspect ratio refers to the ratio of height to width. That is to say, charts should maintain an approximate height to width ratio in order for the integrity of the chart remain intact. Take a look at Figure 14-15 to see what I mean.

The chart at the top of Figure 14-15 is at an appropriate aspect ratio that correctly renders the chart. The bottom two charts display the same data, but the aspect ratios of these charts are skewed. The middle chart is too tall and the bottom chart is too wide. This essentially distorts the visual representation, exaggerating the trend in the chart that's too tall, and flattening the trend in the chart that's too wide.

I've seen lots of people contort their charts just to fit them into the empty space on their dashboards. If you want to avoid distorting your charts, you must keep them at an appropriate aspect ratio. What is that ratio?

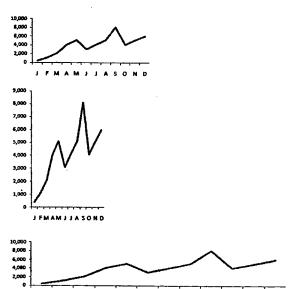


Figure 14-15: A skewed aspect ratio can distort your charts.

Generally speaking, the most appropriate aspect ratio for a chart is one where the width of the chart is about twice as long as the height is tall. For example, 1" tall by 2" wide is an appropriate ratio. 1.5" tall by 3" wide is also appropriate. The actual height and width isn't important. You can make your charts as small or as big as they need to be. What is important is the ratio of height to width.

Don't Be Afraid to Use Something Other Than a Chart

As we've already discussed in Chapter 15, some analyses just don't require a chart. Ask yourself if a simple table will present the data just fine. If the data you are reporting can be more effectively shared in a table, then that's how it should be presented. Remember, the goal of a dashboard is not to present everything in a chart. The goal of a dashboard is to present key data in the most effective way possible.

Chapter 15

Ten Questions to Ask Before Distributing Your Dashboard

In This Chapter

- ▶ Does your dashboard present the right information?
- ▶ Does everything in your dashboard have a purpose?
- ▶ Does your dashboard prominently display the key message?
- ► Can you maintain your dashboard?
- ▶ Does your dashboard clearly display its scope and shelf-life?
- ▶ Is your dashboard well documented?
- ▶ Does your dashboard use overwhelming graphics?
- ▶ Does your dashboard overuse charts?
- ▶ Is your dashboard user-friendly?
- ▶ Is your dashboard accurate?

ou started this book with two chapters that discuss a few design and data modeling principles that, together, make up what could be considered dashboarding's best practices. Before you send out your finished product, it's valuable to check your reporting mechanism against some of the principles covered in this book. Use the ten questions in this chapter as a kind of checklist to ensure your dashboard follows the best practices covered in this book.

Does My Dashboard Present the Right Information?

Look at the information you're presenting and determine if it meets the purpose of the dashboard you identified during the requirements-gathering stage. Don't be timid about clarifying the purpose of the dashboard with the

core users. Avoid building the dashboard in a vacuum. Allow a few test users to see iterations as you develop. This way, clear communication stays open, and you won't go too far in the wrong direction.

Does Everything on My Dashboard Have a Purpose?

Take an honest look at how much information on your dashboard doesn't support its main purpose. In order to keep your dashboard as valuable as possible, you don't want to dilute it with nice-to-know data that's interesting, but not actionable. Remember, if the data doesn't support the core purpose of the dashboard, leave it out. Nothing says you have to fill every bit of white space on the page.

Does My Dashboard Prominently Display the Key Message?

Every dashboard has one or more key messages. You want to ensure that these messages are prominently displayed. To test if the key messages in a dashboard are prominent, stand back and squint your eyes while you look at the dashboard. Look away and look at the dashboard several times. What jumps out at you first? If it's not the key components you want displayed, you'll have to change something. Here are a few actions you can take to ensure your key components have prominence:

- Place the key components of your dashboard in the upper-left or middle-left portion of the page. Studies have shown that these areas are attracting the most attention for longer periods of time.
- De-emphasize borders, backgrounds, and other elements that define dashboard areas. Fry to use the natural white space between your components to partition your dashboard. If borders are necessary, format them to a hue lighter than the one you've used for your data.
- Format labels and other text to hues lighter than the ones you've used for your data. Lightly colored labels give your users the information they need without distracting them from the information displayed.

Can 1 Maintain This Dashboard?

There is a big difference between refreshing a dashboard and rebuilding a dashboard. Before you excitedly send out the sweet-looking dashboard you just built, take a moment to think about the maintenance of such a dashboard. You want to think about the frequency of updates, how often data needs to be refreshed, and what processes you need to go through each time you refresh the data. If it's a one-time reporting event, set that expectation with your users. If you know it'll become a recurring report, you want to really negotiate development time, refresh intervals, and phasing before agreeing to any time table.

Does My Dashboard Clearly Display Its Scope and Shelf Life?

A dashboard should clearly specify its scope and shelf life. That is to say, anyone should be able to look at your dashboard and know the relevant time period and the scope of the information on the dashboard. This comes down to a few simple things you can do to effectively label your dashboards and reports, such as

- Always include a timestamp on your reporting mechanisms. This minimizes confusion when distributing the same dashboard or report on regular intervals.
- Always include some text indicating when the data for the measures was retrieved. In many cases, timing of the data is a critical piece of information when analyzing a measure.
- ✓ Use descriptive titles for each component in your dashboard. Be sure to avoid cryptic titles with lots of acronyms and symbols.

Is My Dashboard Well Documented?

It's important to document your dashboard and the data model behind it. Anyone who has ever inherited an Excel spreadsheet knows how difficult it can be to translate the various analytical gyrations that go into a report. If you're lucky, the data model will be small enough to piece together in a week or so. If you're not so lucky, you'll have to ditch the entire model and start from scratch.



By the way, the Excel model doesn't even have to be someone else's to be difficult to read. I've actually gone back to a model that I built, and after six or so months, I'd forgotten what I had done. Without documentation, it took me a few days to remember and decipher my own work.

The documentation doesn't even have to be highfalutin' fancy stuff. A few simple things can help in documenting your dashboard, such as

- Add a model map tab to your data model. The model map tab is a separate sheet you can use to summarize the key ranges in the data model, and how each range interacts with the reporting components in the final presentation layer.
- Use comments and labels liberally. It's amazing how a few explanatory comments and labels can help clarify your model even after you've been away from your data model for a long period of time.
- Consider using colors to identify the ranges in your data model. Using colors in your data model enables you to quickly look at a range of cells and get a basic indication of what that range does. Each color can represent a range type. For example, yellow could represent staging tables, grey could represent formulas, and purple could represent reference tables.

Is My Dashboard Overwhelmed with Formatting and Graphics?

By now you've probably gotten the point that, when it comes to formatting dashboards and reports, less is more. Eye candy doesn't make your data more interesting. If you're not convinced, try creating a version of your dashboard without the fancy formatting:

- Remove distracting colors and background fills. If you must have colors in charts, use colors that are commonly found in nature: soft grays, browns, blues, and greens.
- De-emphasize borders by formatting them to hues lighter than the ones you've used for your data. Light grays are typically ideal for borders. The idea is to indicate sections without distracting from the information displayed.
- Remove all fancy graphical effects, such as gradients, pattern fills, shadows, glow, soft edges, and other formatting.
- ✓ Remove the clip art and other pictures.

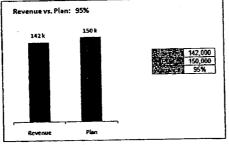
I think that when you compare the two versions, you'll find that the toneddown version does a better job of highlighting the actual data.

Does My Dashboard Overuse Charts When Tables Will Do?

Just because you're building a dashboard, doesn't mean everything on it has to be a chart. In some analyses, a simple table will present the data just fine. You typically use a chart when there's some benefit to visually seeing trends, relationships, or comparisons. Ask yourself if there's a benefit to seeing your data in chart form. If the data is relayed better in a table, that's how it should be presented.

Figure 15-1 illustrates a simple example. The chart on the left and the table on the right show the exact same data. The table does a fine job at presenting the key message of the analysis — revenue is at 95 percent of plan. Why use the chart that requires more real estate, not to mention more work and maintenance?





Is My Dashboard User-Friendly?

Before you distribute your reporting mechanism, you want to ensure that it's user-friendly. It's not difficult to guess what user-friendly means. Usually a user-friendly mechanism has the following characteristics:

Intuitive: Your reporting mechanism should be intuitive to someone who has never seen it before. Test your dashboard on someone and ask him if it makes sense. If you have to start explaining what the dashboard says, something is wrong. Does the dashboard need more labels, fewer complicated charts, a better layout, more data? It's a good idea to get feedback from several users.

- ✓ Easy to navigate: If your dashboard is dynamic, allowing for interactivity with macros or pivot tables, you should make sure the navigation works well. Does the user have to click several places to get to her data? Is the number of drill-downs appropriate? Does it take too long to switch from one view to another? Again, you want to test your dashboard on several users. Be sure to test any interactive dashboard on several computers other than yours.
- Prints properly: Nothing is more annoying than printing a report only to find that the person who created the report didn't take the time to ensure it prints correctly. Be sure you set the print options on your Excel files so that your dashboards print properly.

Is My Dashboard Accurate?

Nothing kills a dashboard or report faster than the perception that its data is inaccurate. It's not within my capabilities to tell you how to determine if your data is accurate. I can, however, highlight three factors that establish the perception that a dashboard is accurate:

- Consistency with authoritative sources: It's obvious that if your data doesn't match other reporting sources, you have a data credibility issue, especially if those other sources are deemed to be the authoritative sources. Be sure you're aware of the data sources that are considered to be gospel in your organization. If your dashboard contains data associated with an authoritative source, compare your data with that source to ensure consistency.
- Internal consistency: It's never fun to explain why one part of your dashboard doesn't jive with other parts of the same dashboard. You should ensure some level of internal consistency within your dashboard. Be sure comparable components in different areas of your dashboard are consistent with each other. If there's a reason for inconsistency, be sure to clearly notate those reasons. It's amazing how well a simple notation can clear up questions about the data.
- ✓ Personal experience: Have you ever seen someone look at a report and say, "That doesn't look right"? He's using what some people call gut feel to evaluate the soundness of the data. None of us look at numbers in a vacuum. When you look at any analysis, you bring with you years of personal knowledge, interaction, and experience. You subconsciously use these experiences in your evaluation of information. When determining the accuracy of your dashboard, take into consideration organizational anecdotal knowledge. If possible, show your dashboard to a few subject-matter experts in your company.

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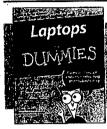
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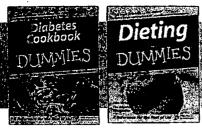
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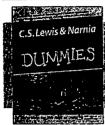
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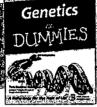
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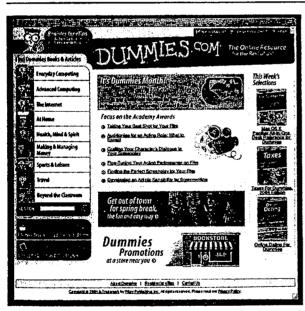
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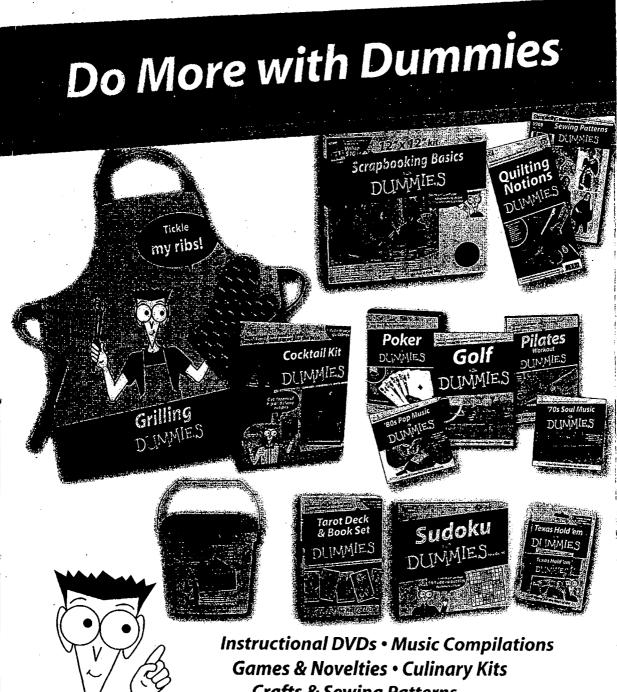
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Performance Dashbalds

Neasing, Nortong, and Managing Your Business

Performance Dashboards

Measuring, Monitoring, and Managing Your Business

erformance dashboards are rapidly becoming the preferred way that business professionals view and analyze information about the performance of their business and the activities they manage. In a nutshell, performance dashboards let busy executives, managers, and staff view the performance of key business metrics at a glance and then move swiftly through successive layers of actionable information in a carefully guided manner, so they get the insight they need to solve problems quickly, efficiently, and effectively. By helping business people keep a pulse on their business and chart progress towards meeting strategic and tactical objectives, performance dashboards are becoming powerful agents of organizational change.

In Performance Dashboards, author Wayne Eckerson shows how performance dashboards focus business people on the right things to do and doing things right. As Director of Research and Services for The Data Warehousing Institute, a worldwide association of business intelligence professionals, Eckerson interviewed dozens of organizations that have built various types of performance dashboards in different industries and lines of business. His practical insights provide a road map to help you turbo-charge performance—management initiatives with dashboard technology to optimize performance and accelerate results.

Performance Dashboards addresses common questions that business professionals ask about performance dashboards, such as: What's the difference between dashboards and scorecards? How do I design performance dashboards to handle operational, tactical, and strategic processes? How do I create effective KPIs that drive organizational change and display them in an optimal fashion? Do I build performance dashboards from the top down or bottom up? What political obstacles will I encounter when launching a performance dashboard project and how do I overcome them?

Performance Dashboards clears up much of the confusion and answers your most critical questions. It starts by laying a conceptual foundation, showing how performance dashboards:

- Fit into the larger context of business performance management (BPM), an emerging discipline for linking strategy and performance
- Represent the "new face" of business intelligence (BI), harnessing reporting and analysis software to unleash the power of information to all types of business users
- Do everything in threes: three types of performance dashboards (i.e., operational, tactical, and strategic) each contain three types of applications (i.e., monitoring, analysis, and management) and three layers of information (i.e., graphical, multidimensional, and transactional)

(continued on back flap)

(continued from front flap)

Moving from concept to reality, Performance Dashboards showcases each type of performance dashboard using a real-world example from Quicken Loans, International Truck and Engine Corporation, and Hewlett-Packard. These and other case studies show you how to build performance dashboards and what benefits they offer. Finally, Performance Dashboards synthesizes the tips and techniques from these case studies and leading practitioners in the field, showing you how to:

- Evaluate your company's organizational and technical readiness to undertake a successful performance dashboard project
- Create effective KPIs that change organizational behavior and improve performance
- Design powerful dashboard screens that communicate relevant facts quickly and concisely
- Integrate existing performance dashboards and metrics using a top-down or bottom-up approach
- Align business and technical teams to deliver a scalable and sustainable solution
- Evangelize a performance dashboard solution and ensure end-user adoption

Whether you are an executive looking to learn more about dashboards or scorecards, an IT professional needing to better understand how to implement dashboards, or a college student preparing for a career armed with the most cutting-edge thinking about how to improve organizational performance, *Performance Dashboards* is for you.



Wayne W. Eckerson Director of Research and Services The Data Warehousing Institute

WAYNE W. ECKERSON is the Director of Research and Services for The Data Warehousing Institute (TDWI), a worldwide association of business intelligence and data warehousing professionals that provides education, training, certification, and research. Eckerson has seventeen years of industry experience, most of which has been spent covering business—intelligence issues and technologies. Eckerson is the author of many in-depth reports, a columnist for several business and technology magazines, and a noted speaker and consultant in the business intelligence industry. He can be reached at weckerson@tdwi.org.

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Praise for Performance Dashi

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that contains both historic and forward-looking measures. Eckerson's book, with its practical advice, is essential reading for anyone moving forward with a dashboard initiative. Even if you are not yet ready to make the move, it is fascinating to read his insights into how some of the industry's smartest competitors keep their finger on the pulse of their business."

-Craig Schiff, President and CEO, BPM Partners, Inc.

"Wayne Eckerson, in his new book on performance dashboards, has defined what business intelligence really is in a practical and prescriptive manner. His book serves anyone who is looking to understand this complex subject and especially provides value to leaders looking to apply business intelligence at their firm. Wayne defines the subject, explains the methodology, and provides the reader with the incentive to take on this challenging effort."

—Irving H. Tyler, Vice President, Information Services and Chief Information Officer,

Quaker Chemical Corporation

"The time is right for a definitive guide to building, managing, and sustaining dashboard and scorecard solutions, and this book fits the bill. As a key ingredient in business performance management, dashboards make it easier to monitor the execution of business strategies and plans, and deliver insight and information to workers across the enterprise. This book is a must-read for business leaders and would-be chief performance officers who want to learn about the tools and techniques needed to harness information and optimize performance."

—Godfrey Sullivan, President and Chief Executive Officer,
Hyperion Solutions Corporation

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Performance Dashboards

Measuring, Monitoring, and Managing Your Business



WAYNE W. ECKERSON



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Published by John Wiley & Sons, Inc., Hoboken, New Jersey. Published simultaneously in Canada.

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Library of Congress Cataloging-in-Publication Data:

Eckerson, Wayne W., 1958-

Performance dashboards: measuring, monitoring, and managing your business / Wayne W. Eckerson.

p. cm.

Includes index.

ISBN-13: 978-0-471-72417-9 (cloth)

ISBN-10: 0-471-72417-3 (cloth), ISBN: 0-471-77863-X (Custom Edition)

Management—Evaluation.
 Organizational effectiveness—Evaluation.
 Title.

HD31.E294 2006

658.4'013-dc22

2005011800

Printed in the United States of America.

10 9 8

To my parents, Homer and Sally, who made everything possible.

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Foreword

wo adages help us to understand the power of performance dashboards. The first is: "You cannot manage what you do not measure." When managers do not know how their work units and subordinates are functioning compared with previous performance, goals, and benchmarks, it is difficult to reward superior achievement or take corrective action when performance fails to meet expectations. The second adage is: "What gets watched, gets done." When workers know the metrics used for their evaluation, they will strive to perform well on those measurements.

Effective managers have always at least implicitly understood these adages and have had systems and methods for assessing how their organizations are doing. Even before computer-based systems, many executives had their staffs prepare briefing books to keep a close tab on organizational performance. The critical success factor concept, which is directly related to today's key performance indicators (KPIs), was designed to identify the goals and activities that need to be monitored most closely. Executive information systems, which focus on tracking key metrics important to senior management, are the most immediate precursors to today's performance dashboards.

Performance dashboards integrate much of what has been learned about how computer-based systems can help in the effective management of organizations. For example, the most powerful systems are linked to company objectives. Performance dashboards also benefit from technology advances. An early problem with executive information systems was that the data required were often not readily available; considerable human effort was needed to acquire, analyze, and then enter the data into the system. Data warehouses have now made the sourcing of data much less of a problem. Also, the technology vendors have developed packages that, in the best cases, sit on top of powerful business intelligence platforms providing analysis capabilities beyond the building of simple variance charts.

X FOREWORD

Despite the growing popularity of performance dashboards, considerable confusion still exists. Common questions include: "What is the difference between dashboards and scorecards?" "Must dashboards be implemented top down, or can they be built bottom up?" Then there are important questions about how to build them successfully, such as: "How should I determine how many and what KPIs to include?" "Are there any political obstacles that I am likely to encounter, and how can I resolve them?"

Wayne Eckerson has written a wonderful book that clears up much of the confusion about performance dashboards, addresses the most important issues, and provides answers to the most critical questions. It is not surprising that Wayne has written such a great book. He combines the conceptualization and writing skills that he honed as a research analyst, the survey data that he has collected in his position as Director of Research and Services for The Data Warehousing Institute, and case studies and examples from hundreds of companies that he has consulted with and interviewed over the years. As a result, the book is wonderfully "textured" and is a "must read" for anyone who wants to understand performance dashboards fully. Whether you are an executive wanting to learn about dashboards, an IT professional who needs to understand how to implement dashboards better, or a college student preparing for a career armed with the latest and best thinking about how to improve organizational performance, you will benefit from reading Wayne's book.

Hugh J. Watson Terry College of Business University of Georgia



A PATH TO PURSUE

False Starts

The original focus of this book was business performance management (BPM). Tim Burgard, my editor at John Wiley & Sons, had read an in-depth report that I wrote on the topic in 2003 and asked whether I would be interested in turning it into a book geared to business professionals. Other than the normal reservations one might have about undertaking a book project in addition to a full-time job, I was not particularly thrilled about exploring BPM in greater depth.

My initial research showed that BPM meant different things to different people. It was a broad, catch-all category of applications and technologies, including everything from financial consolidation and reporting tools to planning, budgeting, and forecasting applications to dashboards and scorecards, among other things. BPM seemed to reflect whatever vendors had in their product portfolios at the time rather than representing a distinct and compelling discipline in itself.

Conceptually, however, most people seem to agree that the purpose of BPM is to focus organizations on things that really matter. Too many organizations spread their energies and resources far and wide and consequently never make much progress towards achieving their strategic objectives. The theory behind BPM is that organizations need to identify the key activities that contribute most to their success and make sure they do them well. In short, the purpose of BPM is to help organizations become more focused, aligned, and effective.

Dashboards and Scorecards

Thus, in the spirit of BPM, I decided to cast off BPM as a book topic and focus on something more tangible and concrete that organizations could use to implement the discipline of BPM. At the time, I did not know any companies that had implemented a BPM solution—whatever that might be—but I did notice that many companies were rolling out dashboards and scorecards. These applications seemed to resonate with workers up and down the organizational hierarchy, from boardrooms to shop floors to customers and suppliers. Better yet, dashboards and scorecards helped companies implement the principles of BPM better than any of the other so-called BPM applications or technologies I saw in the marketplace. Now, here was a topic worth exploring!

As I investigated dashboards and scorecards, I encountered much of the same definitional fuzziness as I did with BPM, albeit on a smaller scale. Every "dashboard" I saw looked and functioned differently and served different purposes. Some looked like reporting portals or electronic briefing books, while others contained mostly text and hand-entered data, and still others featured graphical dials and meters that flickered with real-time data.

The only clarity in the field came from the Balanced Scorecard community, which has well-defined principles and a maturing methodology to help organizations create, display, and manage performance data. However, since there were already many good books about Balanced Scorecards that covered both theory and practice and were written by distinguished consultants and professors, I did not see how I could add much value there!

Nevertheless, I knew that organizations were putting a great deal of energy into building dashboards and scorecards using business intelligence (BI) and data integration tools and technologies—two areas that I have been researching and speaking about for the past ten years. I figured that I could add value by identifying the common threads among these initiatives, create a framework to clarify the discussion about their use, and synthesize best practices for designing, building, and growing these systems from organizations that have already done it. The result is this book.

THE PUZZLE OF PERFORMANCE DASHBOARDS

It took many hours of thought, dozens of interviews, and thousands of words to piece together the puzzle of dashboards and scorecards in a way that provides a clear and complete picture without distorting current perceptions that people have about these systems. In highly abridged form, what I came up with is this: dashboards and scorecards are part of a larger performance management system—which I call a performance dashboard—that enables organizations to measure, monitor, and manage business performance more effectively.

A performance dashboard is more than just a screen with fancy performance graphics on it: it is a full-fledged business information system that is built on a business intelligence and data integration infrastructure. A performance dashboard is very different from plain dashboards or scorecards. The latter are simply visual display mechanisms to deliver performance information in a user-friendly way whereas performance dashboards knit together the data, applications, and rules that drive what users see on their screens.z

Three Applications

To flesh out this skeletal definition a tad more, I came to realize that a performance dashboard is actually three applications in one, woven together in a seamless fashion: 1) a monitoring application, 2) an analysis application, and 3) a management application.

The monitoring application conveys critical information at a glance using timely and relevant data, usually with graphical elements; the analysis application lets users analyze and explore performance data across multiple dimensions and at different levels of detail to get at the root cause of problems and issues; the management application fosters communication among executives, managers, and staff and gives executives continuous feedback across a range of critical activities, enabling them to "steer" their organizations in the right direction.

Three Layers

When I looked at the data that performance dashboards display, I discovered that they let users navigate through three layers or views of information: 1) a summarized graphical view, 2) a multidimensional view, and 3) a detailed or operational view. Users can access the performance dashboard at any of these layers, but most start at the summarized graphical view and drill down along fairly predefined pathways through the multidimensional and detailed views.

This layered approach meets the information and analysis needs of a majority of individuals in an organization who are not number crunchers by training and only want to use information as a tool to perform their jobs, not as a profession in itself. Performance dashboards conform to the natural sequence in which these users want to interact with information. First, they want to monitor key metrics for exceptions; then, they want to explore and analyze information that sheds light on the exceptions and reveals hidden trends and issues; and finally, they want to examine detailed data and reports to identify root causes of problems and take action to remedy the situation.

The New Face of Business Intelligence

In many respects, performance dashboards are the new face of business intelligence. They transform business intelligence from a set of tools used primarily by business analysts and power users to a means of delivering actionable information to everyone in an enterprise. Thus, performance dashboards fulfill the promise of business intelligence to help organizations leverage information to increase corporate agility, optimize performance, and achieve strategic objectives.

Three Types

The final thing I discovered about performance dashboards after talking to many companies is that that there are three types—operational, tactical, and strategic—that are distinguished largely by the degree to which they use the three types of applications listed above (i.e. monitoring, analysis, and management.)

Operational dashboards track core operational processes and emphasize monitoring more than analysis or management; tactical dashboards track departmental processes and projects and emphasize analysis more than monitoring or management; and strategic dashboards monitor the execution of strategic objectives and emphasize management more than monitoring or analysis. An organization can and should have multiple versions of each type of performance dashboard, but they should integrate them using consistent definitions and rules for shared and related metrics.

Success Factors

It is one thing to know what a performance dashboard is and another to implement one successfully. In the course of interviewing people at organizations that have deployed performance dashboards (regardless of what they call them), I discovered many critical success factors. On a macro level, the keys to success are: 1) get proper sponsorship and resources for the project, 2) create the right metrics and standardize their meaning, 3) design a compelling graphical user interface, and 4) plan ahead to ensure end-user adoption and drive organizational change.

Beyond these major success factors, I discovered dozens of tips and techniques that often spell the difference between a successful project and a mediocre one. This book does not pretend to provide a step-by-step methodology for implementing a performance dashboard or a comprehensive list of critical success factors; instead, like a good performance metric, it provides reasonable guidance for the road ahead.

NAVIGATING THIS BOOK

Who Should Read This Book

This book is geared to business and technical managers who oversee performance management projects or who have been recently appointed to create or overhaul an organization's performance management system, including informa-

tion systems and corporate policies and procedures. These managers generally have deep knowledge of their business and suitable experience managing information technology projects. Most are prime candidates to become Chief Performance Officers.

At the same time, business executives can benefit by reading this book. Although it covers the technical underpinnings of performance management and dives into technical detail at points, the book tries to convey technical concepts in plain English. Conversely, technologists will find value in this book because it provides an overview of performance management concepts and a technical framework for implementing them. In addition, Balanced Scorecard professionals will find the book helps them understand how Balanced Scorecards relate to and can be integrated with other types of performance dashboards in their organizations.

Skim, Drill, and Examine

To help you get the most out of the next 250+ pages, let me tell you how I have approached writing the text. First, I know that business people are busy. If you are like me, you rarely get to read an article or report from beginning to end, let alone a book, unless you are on a plane or vacation. You really just want the prescriptions, the key takeaways that you can apply at work tomorrow, next week, or next month.

To accommodate your needs, I have tried to make the book as easy as possible to skim while staying within the publisher's constraints. For example, I have made liberal use of headings, lead-ins, exhibits, captions, and sidebars so they serve as visual guideposts to the content. Glance at these markers as you flip through the pages, and if you spy something that catches your interest, drill down and read the text for a while. (Does this sound like a performance dashboard in book form? I hope so. The concept is universally applicable!)

Sections in the Book

The book is also divided into three sections. Part One, "The Landscape for Performance Dashboards," provides the framework and context for understanding performance dashboards. Chapter 1 defines performance dashboards and describes their primary characteristics. Chapter 2 provides background on BPM, which contributes the conceptual underpinnings for performance dashboards and represents the broader commercial market for related products and services. Chapter 3 explains business intelligence, which contributes the analytical and technical foundation upon which performance dashboards rest. Chapter 4 provides an organizational readiness assessment for organizations preparing to implement a performance dashboard, and Chapter 5 offers a technical readiness assessment based on a BI Maturity Model that I developed in 2004 and has been well received by BI professionals and their business counterparts.

Part Two, entitled "Performance Dashboards in Action," adds flesh to the conceptual framework defined in Part One by profiling each type of dashboard system using an in-depth case study with plenty of screenshots to help you differentiate between types. Chapter 6 provides an overview of each type of dashboard and compares and contrasts the three types at a conceptual level. Chapter 7 examines operational dashboards using Quicken Loans as a case study. Chapter 8 looks at tactical dashboards by profiling a Key Business Indicator (KBI) portal developed by International Truck and Engine Corporation. Chapter 9 examines strategic dashboards by examining a Balanced Scorecard application developed by Hewlett Packard Co.'s Technology Solutions Group.

Part Three is titled "Critical Success Factors: Tips from the Trenches." This section synthesizes recommendations and guidance from dozens of performance dashboard projects that I've researched. Chapter 10 discusses how to launch a performance dashboard project. Chapter 11 discusses how to create effective metrics, which are the backbone of any dashboard system. Chapter 12 switches to the visual design and examines how to create powerful dashboard screens that communicate relevant facts quickly and concisely. Chapter 13 describes several approaches to integrating or linking multiple dashboard systems, whereas Chapter 14 tackles the thorny topic of how to establish an effective partnership between business and the information technology (IT) department, which is required to deliver a long-lasting, high-value dashboard system. Chapter 15 closes with advice on how to ensure end-user adoption and use a performance dashboard as an agent of organizational change.

Feedback Please!

As someone who works for an educational organization, I know that the best learning occurs not in classrooms but in group discussions and individual conversations. Once you finish reading (or skimming) this book, I hope that you take the time to send me your thoughts. Ideas do not stop evolving once they are put on paper. This book is not my final word on the subject; there is always more to learn! Undoubtedly, there are numerous perspectives I did not cover and nuances I overlooked. Please help me write the next edition; send your thoughts to weckerson@tdwi.org. Happy reading!



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Acknowledgments

Although this book focuses on an emerging area of interest to the business community, much of the content was shaped over the course of the past ten years, which I have spent as an analyst, consultant, and educator in the field of business intelligence, which provides the analytical and technical foundation for performance dashboards. Much of what I learned during this period was the result of conversations with hundreds of people who generously shared their time, insights, and camaraderie. Although they are too numerous to mention by name, they include faculty members at The Data Warehousing Institute and my fellow BI professionals at Fortune 1000 companies, consultancies, analyst firms, and vendors. I am eternally grateful to them.

I would like to acknowledge a number of people who contributed directly to the creation of this book. I am indebted to Tim Burgard, my editor at John Wiley & Sons, who approached me with the initial idea and guided me through the process. Special recognition goes to the individuals whose projects I profiled in Part Two and whose experiences and insights helped shape the remainder: Martin Summerhayes of Hewlett Packard, Jim Rappé of International Truck and Engine Corporation, and Eric Lofstrom of Quicken Loans. They spent countless hours with me on the phone and in person answering endless questions and dutifully responding to my every request. This book would not have been possible without their cooperation and enduring patience.

The stories of many other people whom I interviewed were equally compelling, but time, space, or confidentiality prevented me from delving deeper. I would like to thank Viraj Gandhi at Paradigm Management, Doug Smith in the City Administrator's office at the District of Columbia, John Lochrie and Ripley Maddock at Direct Energy Essential Home Services, Kevin Lam at TELUS, Ryan Uda at Cisco Systems, Inc., John Monczewski at Booz Allen Hamilton, Dave Donkin at Absa Bank Ltd., Klaus Detemple at Deutsche Börse, Chris Gentry at

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CCC Information Services Inc., Larry Fox, Todd Klessner, Deb Masdea, Alicia Acebo, Mike Grillo, Greg Jones, Christopher Soong, and Preetam Basil, among others.

Next, I would like to commend the many people who reviewed all or portions of the book and kept me from veering too far afield from my task at hand. Their advice provided desperately needed perspective, nuances, and insights. Professors Hugh Watson and Barbara Wixom provided considerable encouragement and gave me constructive feedback on how to approach the assignment and shape the content. Stephen Few generously shared his rich intellectual capital, advising me on visual design principles in general and on techniques for creating effective dashboard screens in particular. Chapter 12 would not have been possible without his input. Bill Balberg, president of Insightformation, Inc., offered many ways to align my ideas with those circulating in the Balanced Scorecard community and was indefatigable in reviewing my text. Neil Raden pointed out numerous areas for improvement; Colin White helped with the framework, taxonomy, and evaluation criteria; Cindi Howson provided input on evaluation criteria; and my good friend Jim Nowicki provided the all-important business user perspective. I would also like to thank Larissa DeCarlo of Hyperion Solutions, Diaz Nesamoney of Celequest, Tracy Shouldice of Cognos, Rebecca Adams of Business Objects, and Doug Cogswell of ADVIZOR Solutions, Inc. for putting me in touch with customers and providing screen shots upon request.

Going back a few years, I would like to pay tribute to my colleagues and friends at *Network World Magazine* who taught me how to think logically and write clearly and succinctly, as well as Patricia Seybold, whose quiet trust gave me the confidence I needed to acquire a strong professional voice in an industry filled with very smart people.

Also, I would like to thank Peter Quinn and Ellen Hobbs, my managers at The Data Warehousing Institute and 101communications, respectively, who for some strange reason encouraged me in this pursuit and made allowances to ensure I could finish on time. I also appreciate the support and patience of my colleagues at The Data Warehousing Institute, including Meighan Berberich, Michelle Edwards, and Eric Kavanagh, who lent their time and expertise to help market the book, and especially Denelle Hanlon, who always provided encouragement at the right moments. Last, but not least, I thank my wife Christina and my children, Harry and Olivia, who gallantly tolerated the long hours I spent in front of the computer at home when I should have been doing things with them.



The Landscape for Performance Dashboards



What Are Performance Dashboards?

THE CONTEXT FOR PERFORMANCE DASHBOARDS

The Power of Focus

Executives in Training

This summer I found my 11-year-old son, Harry, and his best pal, Jake, kneeling side by side in our driveway, peering intensely at the pavement. As I walked over to inspect this curious sight, I saw little puffs of smoke rising from their huddle. Each had a magnifying glass and was using it to set fire to clumps of dry grass as well as a few unfortunate ants who had wandered into their makeshift science experiment.

In this boyhood rite of passage, Harry and Jake learned an important lesson that escapes the attention of many organizations today: the power of focus. Light rays normally radiate harmlessly in all directions, bouncing off objects in the atmosphere and the earth's surface. The boys had discovered, however, that if they focused light rays onto a single point using a magnifying glass, they could generate enough energy to burn just about anything and keep themselves entertained for hours!

By the time Harry and Jake enter the business world (if they do), they will probably have forgotten this simple lesson. They will have become steeped in corporate cultures that excel at losing focus and dissipating energy far and wide. Most organizations have multiple business units, divisions, and departments, each with their own products, strategies, processes, applications, and systems to support

them. A good portion of these activities are redundant at best and conflicting at worst. The organization as a whole spins off in multiple directions at once without a clear strategy. Changes in leadership, mergers, acquisitions, and reorganizations amplify the chaos.

Organizational Magnifying Glass

To rectify this problem, companies need an "organizational magnifying glass"—something that focuses the work of employees so everyone is going in the same direction (see Exhibit 1.1). Strong leaders do this. However, even the voice of a charismatic executive is sometimes drowned out by organizational inertia.

Strong leaders need more than just the force of their personality and experience to focus an organization. They need an information system that helps them clearly and concisely communicate key strategies and goals to all employees on a personal basis every day. The system should focus workers on tasks and activities that best advance the organization's strategies and goals. It should measure performance, reward positive contributions, and align efforts so that workers in every group and level of the organization are marching together toward the same destination.

Performance Management System

In short, what organizations really need is a performance dashboard that translates the organization's strategy into objectives, metrics, initiatives, and tasks customized to each group and individual in the organization. A performance dashboard is really a performance management system. It communicates strategic

EXHIBIT 4.1 ORGANIZATIONAL MAGNIFYING GLASS



Companies need an "organizational magnifying glass" that focuses the energies and activities of employees on a clear, unambiguous set of goals and objectives laid out in the corporate strategy.

objectives and enables business people to measure, monitor, and manage the key activities and processes needed to achieve their goals.

To work this magic, a performance dashboard provides three main sets of functionality, which I will describe in more detail later. Briefly, a performance dashboard lets business people:

- Monitor critical business processes and activities using metrics of business performance that trigger alerts when potential problems arise.
- Analyze the root cause of problems by exploring relevant and timely information from multiple perspectives and at various levels of detail.
- Manage people and processes to improve decisions, optimize performance, and steer the organization in the right direction.

Agent of Organizational Change

A performance dashboard is a powerful agent of organizational change. When deployed properly, it can transform an under-performing organization into a high flier. Like a magnifying glass, a performance dashboard can focus organizations on the key things it needs to do to succeed. It provides executives, managers, and workers with timely and relevant information so they can measure, monitor, and manage their progress toward achieving key strategic objectives.

One of the more popular types of performance dashboards today is the Balanced Scorecard, which adheres to a specific methodology for aligning organizations with corporate strategy. A Balanced Scorecard is a strategic application, but as we shall soon see, there are other types of performance dashboards that optimize operational and tactical processes that drive organizations on a weekly, daily, or even hourly basis.

Historical Context

Executive Dashboards and Cockpits

Although dashboards have long been a fixture in automobiles and other vehicles, business, government, and non-profit organizations have only recently adopted the concept. The trend started among executives who became enamored with the idea of having an "executive dashboard" or "executive cockpit" with which to drive their companies from their boardroom perches. These executive information systems (EIS) actually date back to the 1980s, but they never gained much traction, because the systems were geared to so few people in each company and were built on mainframes or minicomputers that made them costly to customize and maintain.

In the past 20 years, information technology has advanced at a rapid clip. Mainframes and minicomputers largely gave way to client/server systems, which

in turn were supplanted by the Web as the preeminent platform for running applications and delivering information. Along the way, the economy turned global, squeezing revenues and profits and increasing competition for ever-more demanding customers. Executives responded by reengineering processes, improving quality, and cutting costs, but these efforts have only provided short-term relief, not lasting value.

Convergence

During the 1990s, organizations began experimenting with ways to give business users direct and timely access to critical information, an emerging field known as business intelligence. At the same time, executives started turning to new performance management disciplines, such as Balanced Scorecards, Six Sigma, Economic Value Added, and Activity-Based Costing, to harness the power of information to optimize performance and deliver greater value to the business.

These initiatives convinced many executives that they could gain lasting competitive advantage by empowering employees to work proactively and make better decisions by giving them relevant, actionable information. Essentially, executives recognized that the EIS of the 1980s was a good idea but too narrowly focused; everyone, not just executives, needed an EIS. Fortunately, executives did not have to wait long for a solution. At the dawn of the 21st century, business intelligence converged with performance management to create the performance dashboard.

Market Trends

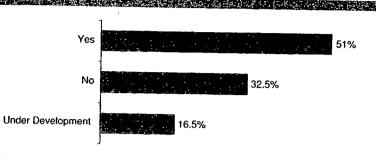
This convergence has created a flood of interest in performance dashboards since the year 2000. A study by The Data Warehousing Institute (TDWI) in 2004 showed that most organizations (51 percent) already use a dashboard or scorecard and that another 17 percent are currently developing one. The same study showed that almost one-third of organizations that already have a dashboard or scorecard use it as their *primary* application for reporting and analysis of data (see Exhibit 1.2).

Benefits

The reason so many organizations are implementing performance dashboards is a practical one: they offer a panoply of benefits to everyone in an organization, from executives to managers to staff. Here is a condensed list of benefits:

 Communicate Strategy. Performance dashboards translate corporate strategy into measures, targets, and initiatives that are customized to each

EXHIBIT 1.2 DOES YOUR ORGANIZATION USE A DASHBOARD OR SCORECARD?



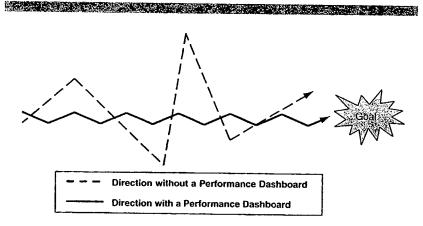
A majority of organizations have already deployed dashboards or scorecards, and many are in the process of building them. Data based on 473 responses to a survey of BI professionals by The Data Warehousing Institute.

Source: Wayne Eckerson, "Strategies for Developing Analytic Applications" (TDWI Report Series, The Data Warehousing Institute, 2005).

group in an organization and sometimes to every individual. Each morning when business people log into the performance dashboard, they get a clear picture of the organization's strategic objectives and what they need to do in their areas to achieve these goals.

- Refine Strategy. Executives use performance dashboards like a steering wheel to fine-tune corporate strategy as they go along. Instead of veering drastically from one direction to another in response to internal issues or industry events, executives can use performance dashboards to make a series of minor course corrections along the way to their destination (see Exhibit 1.3).
- Increase Visibility. Performance dashboards give executives and managers greater visibility into daily operations and future performance by collecting relevant data in a timely fashion and forecasting trends based on past activity. This helps companies close their financial books faster at the end of each month and avoid being surprised by unforeseen problems that might affect bottom-line results.
- Increase Coordination. By publishing performance data broadly, performance dashboards encourage members of different departments, such as finance and operations, to begin working more closely together. They also foster a healthy dialogue between managers and staff about performance results and forecasts and make it easier for managers to conduct more frequent and constructive performance reviews.

EXHIBIT 1.3. CHARTING A COURSE WITH A PERFORMANCE DASHBOARD



A performance dashboard enables executives to chart a steady course to their destination by making a series of fine-tuned course corrections instead of veering dramatically from one direction to another in response to internal or industry events.

- Increase Motivation. It has been said that "what gets measured, gets done." By publicizing performance measures and results, performance dashboards increase the motivation of business people to excel in the areas being measured. Performance dashboards compel people to work harder out of pride and desire for extra pay when compensation is tied to performance results.
- Give a Consistent View of the Business. Performance dashboards consolidate and integrate corporate information using common definitions, rules, and metrics. This creates a single version of business information that everyone in the organization uses, avoiding conflicts among managers and analysts about whose version of the data is "right."
- Reduce Costs and Redundancy. By consolidating and standardizing information, performance dashboards eliminate the need for redundant silos of information that undermine a single version of business information. A single performance dashboard can help an organization shut down dozens, if not hundreds, of independent reporting systems, spreadmarts, data marts, and data warehouses.
- Empower Users. Performance dashboards empower users by giving them self-service access to information and eliminating their reliance on the IT department to create custom reports. Through layered delivery of informa-

tion, structured navigation paths, and guided analysis, performance dashboards make it easy for average business people to access, analyze, and act on information.

• Deliver Actionable Information. Performance dashboards provide actionable information—data delivered in a timely fashion that lets users take action to fix a problem, help a customer, or capitalize on a new opportunity before it is too late. A performance dashboard prevents users from wasting hours or days searching for the right information or report.

In short, performance dashboards deliver the right information to the right users at the right time to optimize decisions, enhance efficiency, and accelerate bottom-line results.

Pretenders to the Throne

Although many organizations have implemented dashboards and scorecards, not all have succeeded. In most cases, organizations have been tantalized by glitzy graphical interfaces and have failed to build a solid foundation by applying sound performance management principles and implementing appropriate business intelligence and data integration technologies and processes. Here are the common symptoms of less than successful solutions:

- Too Flat. Many organizations create performance management systems, especially tactical and strategic dashboards, using Microsoft Excel, Microsoft PowerPoint, and advanced charting packages. Although these applications often look fancy, they generally do not provide enough data or analytical capabilities to let users explore the root cause of problems highlighted in the graphical indicators.
- Too Manual. In addition, some organizations rely too heavily on manual
 methods to update performance dashboards that contain sizable amounts of
 information. Highly skilled business analysts spend several days a week collecting and massaging this information instead of analyzing it. The majority
 of performance dashboards automate the collection and delivery of information, ensuring a sustainable solution over the long term.
- Too Isolated. Some performance dashboards source data from a single system or appeal to a very small audience. As a result, they provide a narrow or parochial view of the business, not an enterprise view. In addition, these dashboards often contain data and metrics that do not align with the rest of the organization, leading to confusion and chaos.

In the end, performance dashboards are only as effective as the organizations they seek to measure. Organizations without central control or coordination will deploy a haphazard jumble of non-integrated performance dashboards. However,

organizations that have a clear strategy, a positive culture, and a strong information infrastructure can deliver performance management systems that make a dramatic impact on performance.

COMPOSITION OF PERFORMANCE DASHBOARDS

Definition

Every performance dashboard looks and functions differently. People use many different terms to describe performance dashboards, including portal, BI tool, and analytical application. Each of these contributes to a performance dashboard but is not a performance dashboard by itself. Here is my definition:

A performance dashboard is a multilayered application built on a business intelligence and data integration infrastructure that enables organizations to measure, monitor, and manage business performance more effectively.

This definition conveys the idea that a performance dashboard is more than just a screen populated with fancy performance graphics: it is a full-fledged business information system designed to help organizations optimize performance and achieve strategic objectives. An equivalent, and perhaps better, term is performance management system, which conveys the idea that it is a system designed to manage business performance. However, since the title of this book uses the term performance dashboards, I will stick with that term on most occasions, although I feel that the two are interchangeable.

Build or Buy

A common question is whether it is better to build or buy a performance dash-board. During the past several years, many software vendors have shipped dashboard or scorecard solutions. Many qualify as performance dashboards, and some do not. Until recently, most companies built their own performance dashboards or started with a vendor tool and customized it extensively to meet their needs.

Most of the companies profiled in this book built performance dashboards using a mix of custom code and BI tools running on standard corporate infrastructure components (i.e., databases, servers, storage systems). However, organizations that have deployed performance management systems within the past two years have frequently used commercial, off-the-shelf products, sometimes customizing them extensively and, in other cases, minimally.

Whether you plan to build or buy a performance dashboard, it makes sense to create a list of criteria against which you can evaluate your solution. The appendix at the end of this book provides a comprehensive set of evaluation criteria.

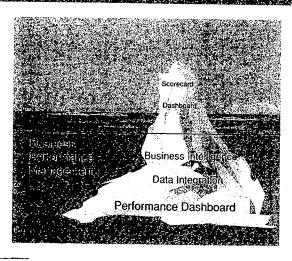
Context

The Big Picture: Business Performance Management

Before we dive into the details, let us step back and examine the context for performance dashboards from a business perspective. A performance dashboard plays a pivotal role in an emerging discipline called business performance management (BPM). As we will see in Chapter 2, BPM consists of a series of processes and applications designed to optimize the execution of business strategy. BPM provides a framework that takes the long-standing task of measuring performance to the next level, that of managing performance. BPM provides the business context in which performance dashboards operate (see Exhibit 1.4).

BPM uses many different tools to help organizations manage performance better, ranging from financial consolidation and reporting tools to planning, budgeting, and forecasting applications to dashboards and scorecards. However, the most important tool in the BPM portfolio is a performance dashboard, because it enables executives to communicate strategic objectives and then measure and monitor the organization's progress toward achieving those objectives. In essence, a performance dashboard helps organizations execute their strategy.





Like an ocean surrounding an iceberg, business performance management (BPM) provides the business context for performance dashboards, which are layered applications built on a business intelligence and data integration infrastructure (i.e., the base of the iceberg). The most visible elements of a performance dashboard are the scorecard and dashboard screens, which display performance using leading, lagging, and diagnostic metrics.

Three Applications

Moving from context to composition, the first thing one notices about a performance dashboard is that it contains three applications woven together in a seamless fashion. Each application provides a specific set of functionality delivered through a variety of means. Technically speaking, the applications are not necessarily distinct programs (although sometimes they are), but sets of related functionality built on an information infrastructure designed to fulfill user requirements to monitor, analyze, and manage performance (see Exhibit 1.5).

1. Monitoring

A performance dashboard enables users to monitor performance against metrics aligned to corporate strategy. At an operational level, users monitor core processes that drive the business on a day-to-day basis, such as sales, shipping, or manufacturing. At a tactical or strategic level, users monitor their progress toward achieving short- and long-term goals.

In general, organizations use dashboards to monitor operational processes and scorecards to monitor tactical and strategic goals. Dashboards and scorecards are visual display mechanisms within a performance management system that convey critical performance information at a glance. They are the lens through which users view and interact with performance data, but they are not the entire system in themselves. Although dashboards and scorecards share many features and people use the terms interchangeably, they have unique characteristics (see Spotlight 1.1).

EXHIBIT 1.5 PERFORMANCE DASHBOARD APPLICATIONS

	Monitoring	Analysis	Management
Purpose	Convey information at a glance	Let users analyze exception conditions	Improve alignment coordination and collaboration
Components	Dashboard Scorecard BI portal Right-time data Alerts Agents	Multidimensional analysis Time-series analysis Reporting Scenario modeling Statistical modeling	Meetings Strategy maps Annotation Workflow Usage monitoring Auditing

A performance dashboard consists of three applications—monitoring, analysis, and management—that deliver related sets of functionality and consist of multiple components.



SPOTLIGHT 1.1 "DASHBOARDS VERSUS SCORECARDS"

Dashboards and scorecards are visual display mechanisms within a performance management system that convey critical performance information at a glance. The primary difference between the two is that dashboards monitor the performance of operational processes whereas scorecards chart the progress of tactical and strategic goals (see Exhibit 1.6).

EXHIBIT I.6 COMPARING FEATURES

	Dashboard	Scorecard
Purpose	Measures performance	Charts progress
Users	Supervisors, specialists	Executives, managers, staff
Updates	Right-time feeds	Periodic snapshots
Data	Events	Summaries
Display	Visual graphs, raw data	Visual graphs, text comments

Dashboards: Dashboards are more like automobile dashboards. They let operational specialists and their supervisors monitor events generated by key business processes. But unlike automobiles, most business dashboards do not display events in "real time" as they occur; they display them in "right time" as users need to view them. This could be every second, minute, hour, day, week, or month depending on the business process, its volatility, and how critical it is to the business. However, most elements on a dashboard are updated on an intra-day basis, with latency measured in either in minutes of hours.

Dashboards often display performance visually, using charts or simple graphs, such as gauges and meters: However, dashboard graphs are often updated in place, causing the graphs to "flicker" or change dynamically. Ironically, people who monitor operational processes often find the visual glitz distracting and prefer to view the data in its original form; as numbers or text, perhaps accompanied by visual graphs.

Scorecards: Scorecards, on the other hand, look more like performance charts used to track progress toward achieving goals. Scorecards usually display monthly snapshots of summarized data for business executives who track strategic and long-term objectives, or daily and weekly snapshots of data for managers who need to chart the progress of their group or project toward achieving goals. In both cases, the data are fairly summarized so users can view their performance status at a glance.

Like dashboards, scorecards also make use of charts and visual graphs to indicate performance state, trends, and variance against goals. The higher up the users are in the organization, the more they prefer to see performance encoded visually. However, most scorecards also contain (or should contain) a great deal of textual commentary that interprets performance results, describes actions taken, and forecasts future results.

Summary. In the end, it does not really matter whether you use the term dashboard or scorecard as long as the tool helps to focus users and organizations on what really matters. Both dashboards and scorecards need to display critical performance information on a single screen so users can monitor results at a glance.

A monitoring application also delivers information to users in "right time"—usually within minutes or hours depending on the volatility of information and decision making requirements—so they can take steps to fix a problem or exploit an opportunity. We cover "right time" information delivery in Chapter 7. Other key elements of a monitoring application are alerts, which notify users when events exceed predefined thresholds of performance, and agents, which automate the responses to well-known exception conditions, such as ordering new stock when inventory falls below predefined levels.

2. Analysis

The analysis portion of a performance dashboard lets users explore large volumes of historical performance data across many dimensions and down to minute detail. The application enables users to evaluate the origins of exception conditions highlighted by the monitoring application and identify the root cause of a problem or issue. The analysis application leverages a variety of BI technologies, including on-line analytical processing (OLAP), parameterized reporting, query and reporting, and statistical modeling, and relies heavily on a data integration and data warehousing infrastructure to prepare and deliver information in an intuitive, timely, and reliable fashion. Chapter 3 describes the various types of BI and data integration tools in depth.

3. Management

A performance dashboard typically embeds a variety of management and collaboration capabilities into the monitoring and analysis applications. The management features support a variety of business processes, both formal and informal, that guide the way users communicate and share performance information. Their purpose is to help executives steer the organization in the right direction, foster improved coordination among business units and groups, and engender better communication among managers, analysts, and staff.

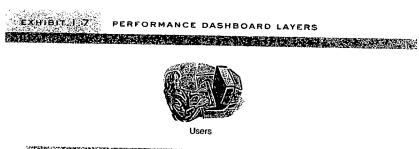
A key management application is performance review meetings. These can be quarterly strategy sessions, monthly operational meetings, individual performance review sessions, or ad hoc conversations between managers and their direct reports. Performance dashboards facilitate these dialogues using strategy maps at the executive level, workflow applications at the team level, and document-based annotations at the individual level. Usage monitoring features track end-user adoption of the performance dashboard and logs changes made to the system for audit and control purposes.

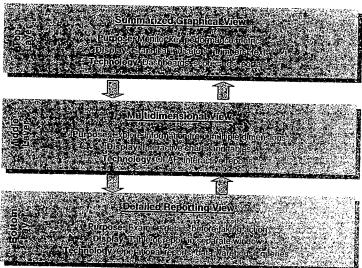
Three Lavers

Besides containing three applications, a performance dashboard consists of three views or layers of information. Just as a cook peels layers of an onion, a performance dashboard lets users peel back layers of information to get to the root

cause of a problem. Each successive layer provides additional details, views, and perspectives that enable users to understand a problem better and identify the steps they need to take to address it.

This layered approach gives users self-service access to information and conforms to the natural sequence in which users want to handle that information: 1) monitor, 2) analyze, and 3) examine. That is, most business users first want to monitor key metrics for exceptions; then explore and analyze information that sheds light on those exceptions; and finally, examine detailed reports and data before taking action. By starting at high-level views of information and working down, this layered approach helps users get to the root cause of issues quickly and intuitively (see Exhibit 1.7).





A performance dashboard delivers information to users in layers as they need it. The top layer graphically displays exception conditions; the middle layer lets users explore or "slice and dice" data from multiple dimensions; and the bottom layer lets users examine individual transactions and operational reports.

Here are the three layers:

- 1. Summarized Graphical View. The top layer provides a summarized view, usually graphical, of the status of key performance metrics and exception conditions. When performance exceeds thresholds applied to each metric, the dashboard or scorecard interface alerts users to the exception condition. These exceptions can be in the form of alerts that pop up on users' screens or arrive via e-mail, pager, or another channel. More commonly, the software changes the color or shape of a symbol or graph associated with the metric. In essence, this layer is where users monitor information. The dashboard, scorecard, or portal interface essentially becomes a graphical exception report.
- 2. Multidimensional View. This middle layer provides the data behind the graphical metrics and alerts. Using multidimensional analysis tools, users navigate the data by dimensions (e.g., customer, geography, or time) and hierarchies (e.g., country, region, or city). More colloquially, these point-and-click tools let users "slice and dice," "drill down or up," or "pivot" the data to view exceptions and trends from any perspective they want. The tools let users apply complex calculations to the data, perform "what-if" analyses, and switch between tables and charts. There are many technologies that support multidimensional analysis. Chief among them are online analytical processing (OLAP), parameterized reporting, and advanced visualization tools.
- 3. Detailed Reporting View. The bottom layer lets users view detailed reports and transaction records, such as invoices, shipments, or trades. Users often need such data to understand the root cause of a problem, such as a decline in sales due to missing or incomplete orders or a salesperson who has been sick. This layer either connects users to existing operational reports or dynamically queries a data warehouse or operational system to obtain the appropriate records. The resulting report or query results are then usually displayed in a separate window, which users can view or print.

Navigating the Layers

Users can access the performance dashboard at any of these three layers, but most start at the summarized graphical layer and drill down along fairly predefined pathways as far as they need or want to go. Many BI tools force users to start at the middle or bottom layers, which makes them difficult to use. Most users find the middle multidimensional layer too complex and the bottom reporting layer too detailed. Only business analysts and operational specialists find it easy to navigate these bottom two layers.

This layered approach to delivering performance information meets the needs of most users in an organization. These "casual" users do not crunch numbers and information for a living; they simply want to monitor and manage the key processes for which they are responsible. They only "casually" use information, perhaps checking a performance dashboard or reports once or twice a day or week, depending on their role and responsibilities.

As a result, performance dashboards, with their layers of information, meet the long-standing mantra of these types of casual users: "Give me all the data I want, but only what I really need, and only when I really need it." In other words, casual users do not want to view information except when there is an out-of-bounds condition, and then they want to view all pertinent data but they do not want to spend precious time looking for it. Performance dashboards meet the requirements of casual users perfectly.

Transparent Navigation

The goal for performance dashboards is to make the transition between the three layers transparent to users. This is challenging since most performance dashboards today use different technologies and tools to support each layer. This gives each layer its own distinctive look and feel, making the performance dashboard more challenging to use than it should be.

Fortunately, some vendors are beginning to blend their monitoring, analysis, and reporting tools—which comprise the three layers in effect—to offer a more homogenous navigation experience for users. In addition, home-grown solutions are building the various components in each layer using a standard programming framework (i.e., .NET or Java) to simplify navigation and ease of use. In the future, performance dashboards will be designed as a single application running against a robust BI infrastructure rather than a combination of disparate applications and components cobbled together from various tools and systems.

Three Types of Performance Dashboards

The last thing you need to know about performance dashboards is that there are three major types: operational, tactical, and strategic. Each type of performance dashboard emphasizes the three layers and applications described above to different degrees (see Exhibit 1.8).

1. Operational dashboards monitor core operational processes and are used primarily by front-line workers and their supervisors who deal directly with customers or manage the creation or delivery of the organization's products and services. Operational dashboards primarily deliver detailed information that is only lightly summarized. For example, an online Web merchant may track transactions at the product level rather

EXHIBIT 1.8 THREE TYPES OF PERFORMANCE DASHBOARDS

	Operational	Tactical	Strategic
Purpose	Monitor operations	Measure progress	Execute strategy
Users	Supervisors, specialists	Managers, analysts	Executives, managers, staff
Scope	Operational	Departmental	Enterprise
Information	Detailed	Detailed/summary	Detailed/summary
Updates	Intra-day	Daily/weekly	Monthly/quarterly
Emphasis	Monitoring	Analysis	Management

There are three types of performance dashboards. Operational dashboards emphasize monitoring more than analysis or management; tactical dashboards emphasize analysis more than monitoring or management; and strategic dashboards emphasize management more than monitoring or analysis.

than the customer level. In addition, most metrics in an operational dash-board are updated on an intra-day basis, ranging from minutes to hours, depending on the application. As a result, operational dashboards emphasize monitoring more than analysis and management. Chapter 7 profiles an operational dashboard from Quicken Loans that monitors the calling activity and sales performance of hundreds of loan consultants working in a huge call center at corporate headquarters.

- 2. Tactical dashboards track departmental processes and projects that are of interest to a segment of the organization or a limited group of people. Managers and business analysts use tactical dashboards to compare performance of their areas or projects, to budget plans, forecasts, or last period's results. For example, a project to reduce the number of errors in a customer database might use a tactical dashboard to display, monitor, and analyze progress during the previous 12 months toward achieving 99.9 percent defect-free customer data by 2007. Tactical dashboards are usually updated daily or weekly with both detailed and summary data. They tend to emphasis analysis more than monitoring or management. Chapter 8 profiles a tactical dashboard used by the International Truck and Engine Corporation to monitor financial and operational performance across several business units.
- 3. Strategic dashboards monitor the execution of strategic objectives and are frequently implemented using a Balanced Scorecard approach, although Total Quality Management, Six Sigma, and other methodologies are used as well. The goal of a strategic dashboard is to align the organization around

strategic objectives and get every group marching in the same direction. To do this, organizations roll out customized scorecards to every group in the organization and sometimes to every individual as well. These "cascading" scorecards, which are usually updated weekly or monthly, give executives a powerful tool to communicate strategy, gain visibility into operations, and identify the key drivers of performance and business value. Strategic dashboards emphasize management more than monitoring and analysis. Chapter 9 profiles a strategic dashboard created by Hewlett Packard's Technology Solutions Group that uses a Balanced Scorecard approach.

Integrating Performance Dashboards

An organization can have multiple versions of each type of performance dash-board. More than likely, each department will have its own operational, tactical, and strategic dashboard. At a minimum, all performance management systems should be logically integrated using a common set of metrics and rules that are populated with data from a common BI and data integration infrastructure. In reality, however, most performance management systems are built separately using unique metrics and rules and different BI and data integration platforms. Although each performance dashboard provides value, collectively they create information chaos. Chapter 13 discusses how to integrate disparate performance dashboards.

PERFORMANCE MANAGEMENT ARCHITECTURE

A performance management system consists of both a business architecture and a technical architecture. Exhibit 1.9 shows the components of these two architectures and how they relate. The linchpin that ties the two architectures together is the metrics that define leading, lagging, and diagnostic measures of business performance. On the business side, the metrics embody the organization's strategy and tactics. On the technical side, the metrics contain rules that define what data to collect and when and how they should be aggregated, filtered, and calculated. The metrics are the means by which organizations measure, monitor, and manage the effectiveness of their strategy and tactics to satisfy key stakeholders.

No organization needs to implement all the components in both architectures. In fact, organizations tend to pick and choose components at each level that best meet the organization's needs. However, it is imperative that organizations choose at least one component in each layer; otherwise things break down. Without a complete and harmonized business and technical architecture, the business would fail to deliver a coherent strategy, workable plans, and accurate metrics, and the technical team would fail to deliver a viable information system.

EXHIBIT 1.9 PERFORMANCE MANAGEMENT ARCHITECTURE

A performance management system consists of a business architecture, represented by stakeholders, strategy, tactics, and metrics, and a technical architecture represented by a performance dashboard, which consists of several layers of components. To deliver a performance management solution, the business and IT department must partner closely.

20

Business Architecture

Stakeholders

By drilling down into the business architecture, one sees that each organization serves many different stakeholders—the investors, board of directors, workforce, customers, suppliers, and regulators—each of whom has a different perspective or view of the organization and wants to see different information. For instance, investors want to see the financial valuation of the organization, the staff wants to see a process view, and customers want to see the value of their accounts or the products and services they have purchased, bid on, or returned.

Strategy

Executives then devise a strategy to meet the needs of those stakeholders. The strategy may start with a strengths, weaknesses, opportunities, and threats (SWOT) analysis, a strategy map, or some other strategy formulation technique. Ultimately, executives create a mission statement, strategic objectives, a vision, values, and long-term plans and goals. (We will discuss strategy in more detail in Chapter 4.)

Tactics

Executives then throw the strategy "over the wall" to managers and supervisors who implement the strategy using a variety of resources—knowledge, money, people, processes, and technology. The upshot is that managers create projects, initiatives, and annual plans or budgets that try to nudge the organization toward its strategic objectives.

Metrics

Executives and managers then translate the strategy and plans into metrics. Strategic dashboards measure initiatives and plans that range from one to five years in scope, whereas tactical dashboards measure initiatives and plans that span several weeks to several months or more. Operational dashboards usually measure daily operations.

There are three major types of metrics: leading, lagging, and diagnostic. In the past, most organizations used lagging indicators, mainly financial metrics, to measure performance and outcomes. However, BPM and Balanced Scorecard methodologies encourage companies to use leading indicators to gain greater visibility into future performance and to manage people, processes, and technology more proactively. We will cover metrics in more detail in Chapter 11.

Technical Architecture

A performance dashboard consists of multiple layers of technology that work together to deliver the information business people need to execute strategy and tactics and meet the needs of stakeholders. The technical architecture consists of interlocking components that must work together seamlessly to deliver business value. Designers should choose the components in each layer that work best to meet the needs of target users.

Display Layer

The metrics are displayed in the top-level screen of a performance dashboard, which can be a dashboard, scorecard, or portal interface. As mentioned earlier, a dashboard is used to monitor operational information and display alerts, whereas scorecards are used to chart progress toward strategic or tactical goals. Portals provide one-stop shopping for all kinds of information, including performance metrics.

Application Layer

The three applications described earlier—monitoring, analysis, and management—reside below the display layer. Application functionality is interwoven with the display, which serves as the opening screen or initial page to the performance dashboard.

Data Store Layer

The application layer gives users access to information, which can be stored in a variety of data stores. Low-latency data stores, including operational data stores and in-memory caches, are ideal for delivering near real-time information to users in operational dashboards. Data warehouses, data marts, and multidimensional databases (MDBs) are best for analyzing historical data in tactical or strategic dashboards and can also be used to store a limited amount of text. In some cases, performance dashboards do not require sophisticated data stores because they do not store large volumes of data (see Spotlight 1.2).

In other cases, performance dashboards pull data directly from source systems to populate metrics, bypassing persistent data stores, like data warehouses, data marts, and multidimensional databases. This approach makes it easy to get a performance dashboard up and running but can bog down the performance of systems that run the business. Organizations should use this virtual dashboard technique judiciously, to supplement information in persistent data stores, not replace them.



SPOTLIGHT 1.2 QUALITY NOT QUANTITY COUNTS

Although performance dashboards can store large volumes of data, this is not a prerequisite for success, especially with strategic dashboards. In fact, some successful strategic dashboards contain only a few gigabytes of data, less than you can store on a single CD ROM.

For instance, Brown & Root, a Halliburton subsidiary that provides marine oil rig construction and services, used a strategic dashboard with small volumes of information to execute a new business strategy that helped turn around the company, from losing money to number one in its niche, with a net income increase of 30 percent. The strategy involved offering high-margin solutions that simultaneously lowered customer costs by integrating offerings from six operating companies in the newly merged firm.

To chart the effectiveness of the strategy, the company used several metrics, none of which required substantial amounts of data, according to Bill Barlberg, president of Insightformation, Inc., a business intelligence and knowledge management consultancy, and a Balanced Scorecard specialist. For example, the company tracked the number of contracts it won that contained integrated solutions involving two or more operating companies. Since the company does a limited number of huge projects each year, the data for these metrics were hand calculated and manually added to the strategic dashboard. Other key metrics included percent of revenue from integrated projects, number of integrated solutions created, and survey results of employee awareness and acceptance of new cultural values.

For strategic dashboards, the quality of information is the key, not the quantity, in some cases, they can deliver significant business value with just a few gigabytes of data, although this is not the norm. As long as a strategic dashboard focuses an organization on what is important, the volume of data is irrelevant.

Integration Layers

To deliver information to users, a performance dashboard must extract it from source systems. An operational dashboard often uses custom application programming interfaces (APIs) or enterprise application integration (EAI) middle-ware to capture events from source systems, move them across a network, and update a low-latency data store within the performance dashboard in near real time. In addition, they may query data sources directly, as mentioned above, using SQL queries or enterprise information integration (EII) middleware. Both techniques enable developers to populate metrics with data from a variety of sources, including analytical systems (i.e., data warehouses, data marts, multidimensional databases, or ODSs), operational systems, and external sources, including XML-based Web pages and Web services.

Tactical and strategic dashboards generally use extraction, transformation, and loading (ETL) tools to populate analytical data stores, although they also can query sources directly to supplement historical data with real-time updates or

external data. Some strategic dashboards are updated manually when they contain small amounts of information or when users need to add commentary. Chapter 3 will discuss data integration technologies in more depth.

Data Sources

Performance dashboard data may come from a wide range of sources. The most voluminous sources of data include legacy systems running on mainframes or minicomputers and newer packaged applications running on relational databases. The most numerous sources, however, include Web pages, Excel files, Access databases, e-mail messages, survey responses, documents, and commentaries, among other things.

Business-IT Partnership

To deliver a successful performance dashboard, the business must work closely with the information technology (IT) department to create metrics that embody strategic objectives and compare performance to plans. Since strategy and plans are constantly changing, these two groups work closely together to create a performance management system that delivers lasting and significant value. Chapter 14 addresses the all-important issue of how to establish a strong partnership between the business and technical teams.

SUMMARY

Definition. Many organizations lack focus. They may devise strategies but not communicate them well to employees, who often work at cross-purposes without clear guidance from above. For organizations to become both efficient and effective, they need to implement a performance management system that translates the organization's strategy into objectives, metrics, initiatives, and tasks customized to each group and individual in the organization. The system can then provide business people with the information they need to measure, monitor, and manage the key activities and processes they need to achieve their goals.

Applications. A performance dashboard consists of applications that monitor, analyze, and manage performance. The monitoring application is delivered via a dashboard, scorecard, or portal interface. The analysis application is delivered via a business intelligence and data integration infrastructure that provides users with self-service access to the relevant data they need to analyze performance issues in a timely fashion. The management application allows business users to collaborate with other coordinated activities between departments and to optimize performance over the long haul.

Layers. Well-designed performance dashboards let users drill down from graphical views of performance metrics and their status to detailed information, even down to individual transactions in operational systems if required. Performance dashboards are really glorified exception reports that alert users to out-of-bounds conditions and then guide them quickly and effortlessly into an exploration of the root causes of the issue.

Types. There are three types of performance dashboards. Operational dashboards enable front-line workers and supervisors to monitor operational processes that drive the business on a daily basis. Tactical dashboards let managers and business analysts investigate historical trends and issues against large volumes of information from across the enterprise. Strategic dashboards highlight strategic objectives and the activities and tasks users need to accomplish to achieve those objectives. Sometimes strategic dashboards deliver significant value using very little data.

Architecture. A performance dashboard is a multilayered application built on a business intelligence and data integration infrastructure that enables organizations to measure, monitor, and manage business performance more effectively. To accomplish this, business people and technologists must work together. On one hand, business people need to develop coherent strategies and tactics to meet the needs of stakeholders. On the other, they must work with technologists to create effective metrics that measure the status and progress the organization is making with its strategies and tactics. It takes two to tango and build an effective performance dashboard.



The Role of Business Performance Management

THE LANDSCAPE

Understanding Business Performance Management

Setting the Context

Chapter 1 showed that performance dashboards put business performance in context. They provide a visual interface and a set of analytical and management tools to help organizations monitor, analyze, and manage performance better. However, to understand performance dashboards fully, we need to put them in context as well. In this case, the context is an emerging management discipline and technology solution known as business performance management (BPM).

BPM, which was introduced briefly in Chapter 1, is quickly becoming a familiar term in the business world. It is a business strategy that ties together a number of related management disciplines, processes, and tools into a coherent whole. Performance dashboards play a pivotal role in BPM; they represent the most visible face of a BPM initiative.

Confusion Reigns

Unfortunately, there is much confusion about what BPM is—and is not. Much of the confusion stems from the fact that BPM involves multiple processes and applications that organizations have already implemented. These range from strategic planning to financial consolidation and reporting; from planning and budgeting to forecasting and modeling; and from business intelligence and reporting

to dashboards and scorecards. When introduced to the concept of BPM, many managers rightfully exclaim, "We've been doing that for years!"

However, most organizations have not pulled these applications and processes together in a cohesive and concerted way—using a common strategic and technical framework to drive all parts of the organization toward a common set of goals and objectives. Today, organizations implement BPM applications and processes in isolation from each other. Each application provides some local benefit but little global value.

Different Acronyms

Confusion also arises because industry experts cannot agree on what to call BPM, let alone how to define it. Although most experts and users prefer the term "business performance management," others use different names. Gartner Group, a leading technology research firm, favors the term "corporate performance management," whereas some leading software vendors prefer "enterprise performance management."

To add to the confusion, most organizations have a performance management process that they use to measure and evaluate employees on objectives defined by human resources and determine bonus payments and compensation. Although BPM encompasses individual performance plans and reviews, it is much broader than this. Finally, many middleware vendors use the term BPM to stand for business process management, a related but distinct discipline (see Spotlight 2.1).

SPOTLIGHT 2.1 BPM VERSUS BPM

Like the old "Spy vs. Spy" cartoons in Mad Magazine; business performance management and business process management are distinct but related disciplines. Both seek to optimize business processes; but one approaches the task from the top down and the other from the bottom up.

Business performance management is a top-down discipline that helps executives understand what processes are needed to achieve strategic objectives and then measure the effectiveness of those processes to deliver the desired results. Conversely, business process management is a bottom-up approach designed to automate and optimize existing business processes using modeling, workflow, and enterprise application integration tools.

Business Process Management

The Gartner Group defines five key elements of a business process management system. Translated into business friendly language, they are 1.

 Graphical modeling tools that enable business users to define and optimize the flow of information among business processes and the applications that support them.



SPOTLIGHT 2.1 (CONTINUED)

- An application engine that executes and manages the flow of information
 among applications and notifies business people when they must handle certain
 tasks in the process.
- An adaptive system that adjusts the flow of information in response to various conditions and automatically updates worklists and tasks accordingly.
- 4. Monitoring tools that monitor and manage process and system performance and highlight out-of-bounds conditions:
- Analytical tools that enable users to analyze historical data about process flows:

Most business process management vendors started out selling enterprise application integration (EAI) middleware that links applications together in near real time. They have since added process modeling and management tools as well as business intelligence tools and operational dashboards to deliver a complete system.

In addition, most people use the term BPM informally as shorthand for something else. At a conference I attended in 2003, one speaker equated BPM to budgeting, another to financial consolidation, and a third to compliance with the Sarbanes-Oxley Act. In addition, I found attendees who thought BPM meant either financial reporting, scorecarding, or business intelligence.

BPM Definition

In retrospect, these presenters and attendees were both right and wrong. Budgeting, scorecarding, and business intelligence are all components of BPM. You cannot do BPM without them. They are not BPM alone, however. BPM is much broader and bigger than any of these individual components (see Spotlight 2.2).



Business performance management (BPM) is a management framework that contains the following applications and tools, among others, depending on which vendor or consultant you talk to. It is important to know that BPM is not any of these things individually.

- Performance dashboards
- . Budgeting or planning
- · Financial consolidation
- · Financial reporting
- · Business intelligence



SPOTUGHT 2.2 (CONTINUED)

- Portals with embedded key performance indicators
- Stratégy maps
- Forecasting software
- Modeling tools for planning

To deliver a true BPM solution, organizations must integrate all the above components in a cohesive and seamless way using a common strategic and technical-framework.

After much research and some soul searching, I decided to put a stake in the ground and define BPM. My "big picture" definition is: a series of organizational processes and applications designed to optimize the execution of business strategy.

Managing the Business

The concepts behind managing a business are straightforward: Executives set strategy and goals, managers develop plans and budgets to achieve the goals, and the staff executes the plans. Then, everyone continuously monitors their progress toward meeting the goals using reports and analytical tools, and they make course corrections as needed to stay on track. However, defining a good strategy and executing it are two different tasks. BPM processes and tools support good management practices and make it easier for executives at all levels to identify, communicate, and monitor key drivers of business value.

Strategy Gap

Ironically, the prospects for BPM are bright because the state of business management in most companies is so poor. The main problem is that there is a huge gap between strategy and execution. Executives spend days or weeks devising well-crafted strategies and then throw them "over the wall" to the rest of the company, hoping and praying that their vision will bear fruit. Usually, nothing much happens. The organization is deaf to the executives' guidance and direction. Inertia reigns supreme.

Broken Budgets

Another problem is that traditional planning and budgeting cycles—based on centuries-old bookkeeping practices—are no longer fast or flexible enough to meet the accelerated pace of business today. Most plans and budgets are simply

irrelevant and out of date before they are completed. Most employees view the budget as a mindless hoop to jump through, a corporate rain dance, rather than a real aid to planning and management.

Lack of Focus

Most people think that BPM is simply about improving performance in general, but it is not. BPM is about improving performance in the right direction. It is possible for organizations to work efficiently but not effectively. Groups and teams may work long hours with great enthusiasm, but if they develop or refine the wrong processes, products, or services, then all their sweat, blood, and tears will not help the company achieve its strategic goals. BPM is designed to help organizations focus on the few things that really drive business value instead of many things that generate activity but do not contribute to the organization's long-term health or viability (see Spotlight 2.3).

SPOTLIGHT 2.3 INTEGRATED BPM: BOOZ ALLEN HAMILTON

Booz Allen Hamilton, one of the world's leading strategy and technology consulting firms, has developed an integrated scorecarding, planning, and reporting solution that helps align the firm to corporate strategy and provide timely, accurate, consistent, and transparent information to the entire organization.

In 2003, the firm's Global Operations team, which provides infrastructure and business support services to the consulting business units, began building individual scorecards for 75 teams across the business. In 2004, it began to align the key performance indicators in these scorecards to the Global Operations team's five strategic themes and seven overarching strategic initiatives and then cascading the scorecards down the organizational hierarchy. Today, the scorecards measure both strategic and operational measures and have become an integrated part of how the company does business (see Exhibit 2.1 for Booz Allen Hamilton's top level scorecard).

To align the business further, Booz Allen Hamilton also overhauled its planning and financial reporting systems and integrated them with the scorecards. To ensure integration, the company purchased software for planning, scorecarding, and financial reporting from Hyperion Solutions.

The planning system replaces a cumbersome, largely manual, Excel based process. Today, the planning system automates the creation and delivery of planning, budgeting, and forecasting templates based on previous history. It standardizes the rules and maintains them in a centralized repository. This has greatly accelerated the planning process, reduced errors, and enabled the company to make changes in the model and automatically update all plans everywhere.

Moreover, the company aligns its plans to strategic objectives and then uses plans to drive measures in the scorecards. "We can take information in the plan and arrive at targets and ranges we want to use in the scorecard itself," says John Monczewski, senior manager of firm-wide financial reporting at Booz Allen Hamilton.



SPOTLIGHT 2.3 (CONTINUED)

Although Booz Allen Hamilton was best of breed for time to close its financial books, it needed to accelerate the speed with which it distributed financial reports, which several years ago were primarily paper-based reports compiled by almost 100 analysts who used slightly different metric definitions for common terms. Today, the firm generates interactive financial reports online. By centrally generating online reports, the firm has reduced distribution and printing costs, standardized metrics, and reduced the time to distribute end-of-month financial reports by more than 50 percent.

"We've gone from no idea how to measure strategy and a planning process that was pretty broken to one that is consolidated and efficient with one portal for managing plans, strategy, and performance," says Monczewski.

BPM Benefits

BPM bridges the gap between strategy and execution. According to Brenda Moncla, a consultant at ThinkFast Consulting, this results in three major benefits:

- 1. Improves Communication. BPM provides executives with an effective mechanism for communicating strategy and expectations to managers and staff at all levels of the organization via planning models and performance metrics tied to corporate goals and objectives.
- 2. Improves Coordination. BPM also fosters a two-way exchange of ideas and information, both vertically between levels within an organization and horizontally among business units, departments, and workgroups that manage a shared activity.
- 3. Improves Control. BPM enables staff to adjust plans continuously and fix or improve operations in a timely manner by providing them with up-to-date information about market conditions and the status of operational processes.

Interestingly, organizations gain many of these benefits when they implement performance dashboards, especially strategic dashboards. This demonstrates that performance dashboards play a central role in BPM solutions.

Research shows that most organizations implement BPM solutions for a variety of reasons. The primary ones are to gain greater visibility into the business, execute strategy better, improve process efficiency, react faster to business events, improve strategic planning, and deliver a more consistent view of business information (see Exhibit 2.2).

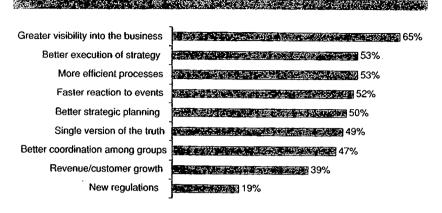
The desire among executives to gain greater visibility into the operations of their business is fueled in part by the U.S. Sarbanes-Oxley Act of 2002, which

EXHIBIT 2.1 STRATEGIC DASHBOARD HOMEPAGE

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The top-level view of Booz Allen Hamilton's strategic dashboard categorizes and maps strategic objectives and indicates its progress using colored stoplight icons on each objective.

EXHIBIT 2.2 WHY IMPLEMENT BPM?



Based on 2004 survey of 635 respondents who have deployed a BPM solution; conducted by The Data Warehousing Institute, 2004.

Source: Wayne Eckerson, "Best Practices in Business Performance Management: Business and Technical Strategies" (TDWI Report Series, The Data Warehousing Institute, 2004).

established strict new standards for corporate governance and financial disclosure. In particular, section 409 of the Act calls for organizations to provide real-time disclosure of material events that may affect performance. Combined with heightened competition and the accelerating pace of business today, organizations feel a pressing need to know what is happening in their operations at all times.

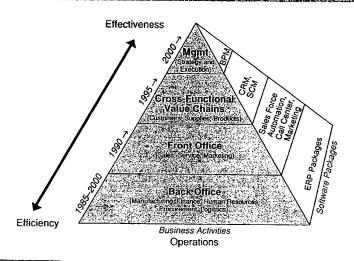
The desire to react to events faster and deliver a single version of the truth is also a primary reason why organizations are implementing business intelligence, which will be covered in Chapter 3. Although the respondents in the survey mentioned above are largely BI professionals, nevertheless this demonstrates the central role that business intelligence plays in BPM and, conversely, performance dashboards.

Evolution of Application Packages

The Last Big Market for Business Software?

From a technology perspective, BPM is merely the latest—and perhaps the last—business function that corporations are "automating" with packaged application software. Starting in the 1980s, organizations deployed software packages to integrate and automate back-office operations, such as manufacturing, finance, and human resources. In the 1990s, organizations deployed software packages to support and enhance front-office activities, such as sales, service, and marketing. In the

EXHIBIT 2.3. THE EVOLUTION OF BUSINESS SOFTWARE PACKAGES



In the past 20 years, companies have employed software packages to integrate and optimize increasingly higher business functions, the latest being business management using BPM solutions.

late 1990s, organizations purchased software packages to optimize cross-functional processes, such as supply chains and customer relationships (see Exhibit 2.3).

Today, one of the last remaining business areas to be automated or fully supported by packaged software is business management. This is the domain of BPM, and it might be the last great untapped market for business software. By virtue of its position at the top of the business pyramid, BPM software holds a commanding view of the rest of the organization, with its processes and activities. Whereas software at lower levels of the business pyramid focuses on increasing the efficiency of business processes, BPM serves as the brains or central nervous system of the entire organization. BPM enables organizations to work more effectively, not just more efficiently, to achieve strategic objectives.

Return on Investment

As a result, BPM has the potential to provide the highest return on investment (ROI) of any business software to date. This is why many vendors are racing to get into the BPM market. Unfortunately, calculating the ROI of BPM is sometimes challenging, because BPM solutions deliver largely intangible benefits, such as better strategies, more alignment, faster access to information, better decisions,

and so on. Enlightened executives intuitively understand the value BPM solutions provide, whereas more "bottom-line"-oriented executives may hold off implementing BPM until they see quantifiable ROI.

A FRAMEWORK FOR BPM

Four-Step Process

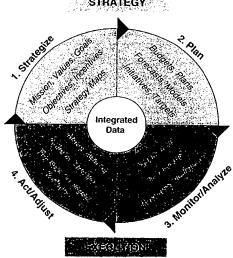
If BPM optimizes business management, what is the process by which it works? What are its components? What are the technologies required to support it?

BPM is a four-step, closed-loop discipline that turns business strategy into action. The steps are as follows: 1) Strategize, 2) Plan, 3) Monitor/Analyze, and 4) Act/Adjust (see Exhibit 2.4).

The first two steps in the top half of the circle—Strategize and Plan—constitute the "strategy." The last two steps in the bottom half of the circle—Monitor/Analyze and Act/Adjust—"execute" the strategy. Within each step, organizations

EXHIBIT 2.4 BPM FRAMEWORK

STRATEGY



BPM is a four-step process divided equally between strategy and execution. Each step is permitted by the various techniques or technologies shown in the quadrants and supported by a consistent set of integrated data.

use enabling techniques or technologies to support the process. For example, the Plan step uses budgeting, planning, and forecasting software to define initiatives, allocate resources, and establish targets.

When all steps in the BPM process are executed in a concerted manner, they enhance communication, control, and coordination among staff and groups in the organization. In many ways, BPM greases all the parts of the organizational engine to keep it moving in the right direction. The following sections describe the four major steps in the BPM process in more detail.

Step 1: Strategize

Here, executives define key drivers of business value and ways to measure them. "World class companies focus on value drivers to improve financial performance. They set targets and measures for each driver," says Lawrence Serven, principal at the Buttonwood Group, a management consulting firm in Stamford, CT.

Examples of drivers might be "high customer satisfaction" or "excellent product quality." Measures for these drivers might be "customer satisfaction index" and "number of defects per thousand," respectively. The strategizing process also defines or reaffirms the mission, values, and vision for the organization and sets the goals and objectives to accomplish the mission.

Top executives are not the only ones who can define strategy. Any team of executives or managers in charge of a business unit or department can develop strategies and plans. However, lower level executives must be careful to tie their drivers, measures, and goals to those at the level above them and those of the organization as a whole.

Enablers

Measures of business drivers are called key performance indicators (KPIs). KPIs measure how well the organization or individual performs an operational, tactical, or strategic activity that is critical for the current and future success of the organization. KPIs should drive individuals and teams to take action that leads to positive outcomes. As we shall see in Chapter 11, it is not easy to create effective KPIs.

Organizations define drivers, goals, and objectives in strategic planning sessions, which can last several days, weeks, or months. One technique for defining business drivers and KPls is "strategy mapping," which emanates from a BPM methodology known as Balanced Scorecard. Strategy mapping helps executives define business drivers, objectives, and metrics and map their cause-effect relationships at various levels of an organization. I will discuss strategy maps in more detail in Chapter 9.

Incentives are another key tool that executives use to reinforce value drivers and KPIs. Most companies have systems to evaluate and reward employees for per-

formance, but many of these systems are not tied to strategic objectives and KPIs. Many experts believe that BPM cannot be implemented effectively unless the organization ties performance to compensation.

Step 2: Plan

Next, groups within the organization meet to develop plans to carry out the business strategy and allocate resources. The plans may involve creating new initiatives, projects, and processes, or refining or reaffirming existing ones.

Enablers

The primary planning tool is the budget or plan, which allocates resources—people, knowledge, technology, equipment, and money—to carry out the group's goals. The planning process involves breaking down high-level corporate objectives (e.g., "increase market share by 10 percent") into discrete targets and operating models (or scenarios) for every group at each level in the organization. The groups then create projects and processes to meet those targets.

Fixing the Planning Process

Experts agree that planning should be a collaborative process that ties together people across the organization rather than a spreadsheet-driven corporate ritual that imparts little value. Unfortunately, the budgeting process is broken in most organizations. It projects last year's activities onto the coming year and, once approved, is rarely adjusted as circumstances change.

Part of the problem is that most organizations use custom spreadsheets to disseminate and collect data, a process that is cumbersome, error prone, and time consuming. Another pitfall is that many companies do not have a standard planning process or shared definitions for calculating currency conversions or the fully loaded cost of hiring a new worker, for example. If each business unit has a separate planning system, it becomes virtually impossible to align the organization and deliver a consistent view of business activity.

New Web-based planning solutions promise to transform budgeting from a backward-looking, static, and labor-intensive process to one that is dynamic, forward-looking, and tied to strategic drivers and objectives. Leading-edge companies are moving away from grueling, bottom-up budgeting to continuous planning with rolling forecasts based on actual performance.

Step 3: Monitor/Analyze

Ideas are a dime a dozen. It is easy to devise strategies and plans. What is difficult is executing them. This requires good people armed with powerful information

tools and clear direction from the top. Therefore, the most critical elements of a BPM solution are the tools that let users monitor and analyze performance in a timely manner and take action to improve performance—in other words, a performance dashboard.

Chapter 1 showed that a performance dashboard consists of BI tools for reporting and analyzing information, a data integration infrastructure for collecting and integrating data from diverse sources, data storage systems, such as data warehouses and data marts, and monitoring and management tools. Collectively, these tools and components enable business users to access and analyze information and chart their progress toward achieving strategic objectives and optimizing performance.

Step 4: Act and Adjust

The last part of the BPM process is the most critical. It is the action component. To execute strategy, workers must take action to fix broken processes before they spiral out of control or to exploit new opportunities before they disappear.

Performance dashboards play a key part in the Act/Adjust phase because they alert users to potential problems, and provide them with additional detail and guidance to help them make fast, high-quality decisions. "It's not enough to provide just metrics," says one IT professional. "If the metrics show something is wrong, the first thing users want is more information." For well-known processes, organizations are also implementing intelligent agents, which automatically recommend or take action in response to predefined events. For example, one online travel site uses an operational dashboard to alert managers to surges in demand that require expansion of their inventory of airline seats and hotel rooms for sale.

Organizations also need to adjust plans and forecasts to reflect changing market conditions. With centralized, Web-based planning systems, staff can more easily adjust forecasts and models they have built into their plans and budgets. Forward-thinking organizations are using these tools to move to a continuous planning environment. For example, one equipment manufacturer now reforecasts sales eight times a quarter and financials once a quarter after implementing a continuous planning solution. The company now closes its plans up to 90 percent faster using half the staff.

BPM TRENDS

Status

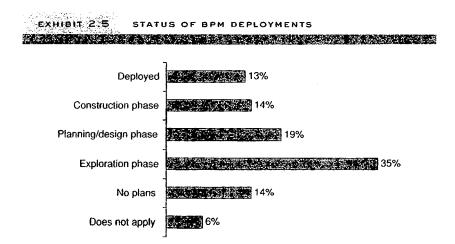
Despite the widespread publicity about BPM, few organizations have deployed BPM solutions, and most have only implemented one or two BPM components, typically budgeting software, performance dashboards, or BI tools. Unfortunately,

most companies implement these applications in isolation rather than in an integrated fashion. Vendors are helping to move the BPM market along by evangelizing the value and scope of BPM solutions and offering integrated BPM solutions that comply with the framework described above.

According to research from The Data Warehousing Institute (TDWI), only 13 percent of respondents have implemented a BPM solution. However, another third (33 percent) are under construction or in the planning/design phase, and another third are exploring whether to implement a BPM solution. Only 14 percent have no plans (see Exhibit 2.5). Among the 13 percent of organizations that have deployed BPM, less than a third (21 percent) have had a solution in place for more than two years. Thus, BPM is in its early adopter phase in most organizations.

Scope and Growth

Most organizations that deploy BPM do so on an enterprise basis. These are not necessarily CEO-led initiatives that touch every employee in the organization, rather, many BPM solutions—whether they represent a single component of BPM or the entire framework—are initiated by a business unit, a region, or a department (e.g., typically, finance, operations, or sales). If these initiatives are successful, they quickly spread throughout the enterprise.



Only 13 percent of organizations have deployed a BPM solution, although one-third (33 percent) are in construction or planning/design phases, according to a survey of 796 respondents by The Data Warehousing Institute, 2004.

Source: Wayne Eckerson, "Best Practices in Business Performance Management: Business and Technical Strategies" (TDWI Report Series, The Data Warehousing Institute, 2004).

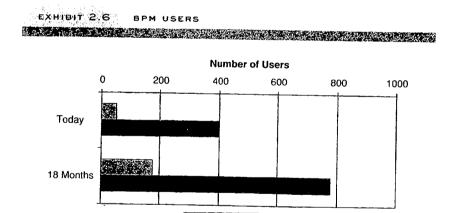
For example, Hewlett Packard Co.'s Technology Solutions Group (TSG), which is profiled in Chapter 9, deployed a strategic dashboard in early 2002 to measure customer service in its European region. The initial solution contained nine metrics and was rolled out in seven weeks to 800 users. Within 18 months, the system grew to support more than 120 metrics and 5,500 registered users in Hewlett Packard TSG worldwide.

Number of Users

Research shows that organizations implementing BPM solutions will experience the same explosive growth as Hewlett Packard TSG. Organizations estimate that the average number of BPM users will jump almost 100 percent, from 404 users to 777 users in 18 months. The median number of users shows an even greater percentage growth, increasing from 50 to 175 in 18 months. The median numbers are more reflective of reality, because a few very large BPM solutions skewed the average numbers (see Exhibit 2.6).

Type of Users

In addition, most BPM solutions support a balanced mix of users: executives (25 percent), midlevel managers (27 percent), business analysts (27 percent), and



Most BPM solutions grow exponentially once deployed. Based on a survey of 796 respondents by The Data Warehousing Institute, 2004.

■ Average –

□ Median -

Source: Wayne Eckerson, "Best Practices in Business Performance Management: Business and Technical Strategies" (TDWI Report Series, The Data Warehousing Institute, 2004).

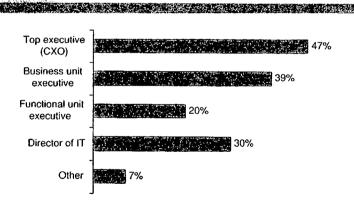
operations personnel (29 percent combined), according to research from TDWI. Only five percent said they allow customers and suppliers to participate in a BPM solution. For example, Hewlett Packard TSG initially geared its strategic dashboard to senior executives who wanted a global view of key metrics, but it quickly modified the application to support managers at all levels in the organization, including field offices with perhaps a dozen or fewer employees.

Business Drivers

Given the strategic nature of BPM and its imperative to improve business management, it is not surprising that top executives are the predominant drivers of BPM solutions. Almost half of all solutions (47 percent) have been spearheaded by C-level executives (CEO, CFO, COO), followed by business unit executives (39 percent). Top technical executives (CIO/director of IT) led the initiative in one-third (30 percent) of the cases (see Exhibit 2.7).

Most projects also have more than one executive driver, especially when top executives are leading the charge. Typically, top executives sponsor the project and evangelize its importance to the company, but divisional executives or heads of IT drive the project, especially if it is initiated in a single division or functional area.





Top executives initiate more BPM solutions than other managers. Percentages don't equal 100% because users could select more than one answer. Based on 360 respondents in a survey conducted by The Data Warehousing Institute, 2004.

Source: Wayne Eckerson, "Best Practices in Business Performance Management: Business and Technical Strategies" (TDWI Report Series, The Data Warehousing Institute, 2004).

Strategic Value and Satisfaction

When asked how strategic the BPM project is to executives, most respondents to the TDWI survey said either "very strategic" or "fairly strategic" (86 percent total). An almost equal percentage (81 percent) said the executives were either "very satisfied" or "fairly satisfied" with the BPM solution. More than half (57 percent) said their estimated ROI was "high" or "medium."

Although these data show promising early results for BPM, the jury is still out. Because BPM solutions are still in their early adoptive phase, it will take a few years before we know for sure whether BPM can transform the management of organizations to be more efficient and effective in executing strategy and goals.

SUMMARY

Confusion about BPM. Performance dashboards are part of a larger strategic initiative known as business performance management (BPM). Unfortunately, there is considerable confusion about what BPM is and is not. Part of this confusion stems from the fact that BPM is still in its infancy, both as a management discipline and as an integrated software solution. Confusion also exists because experts call it different things, including corporate performance management and enterprise performance management. Also, many people confuse BPM with business process management, which is a distinct, but related, discipline.

Business Management Discipline. In its essence, BPM is about improving business management using software tools to improve execution of business strategy. Given this definition, performance dashboards play a critical role in BPM. Executives translate strategy into metrics and goals, which are displayed in performance dashboards. Performance dashboards are the vehicle by which executives communicate strategy to all employees at every level of the organization. Performance dashboards also align activities of all workers and groups to the strategy so everyone is marching in lock step toward the same destination.

Last Great Software Market. BPM is perhaps the last big market for business software. It sits at the top of the business pyramid, serving as a command and control center for the entire organization. It helps optimize the use of other software packages used to increase the efficiency of business processes at lower levels of the organization.

Four-Step Framework. As a management discipline, BPM prescribes a four-step framework: 1) Strategize, 2) Plan, 3) Monitor and Analyze, and 4) Act and Adjust. The first two steps define an organization's strategy; the last two steps execute the strategy. Performance dashboards support the execution of strategy and enable users to monitor and analyze performance, adjust plans and forecasts, and take action to optimize results.

Rapid Growth. BPM as a management discipline and software applications is still in its infancy. Only a fraction of organizations has deployed a BPM solution, although a large percentage is in the planning or design phase. Those organizations that have deployed BPM solutions—particularly strategic dashboards—report that they expand fast, spreading across departments and business units and adding users at a rapid rate. Most BPM solutions are initiated by chief executives, although business unit heads and IT directors also lead the initiatives.

NOTE

1. Excerpted from a Gartner Group Research Note, "A BPM Taxonomy: Creating Clarity in a Confusing Market," T-18-9669, 29 May 2003 in a white paper "A Closer Look at BPM" (Ultimus, Inc., January 2005).



The Role of Business Intelligence

THE VALUE OF BUSINESS INTELLIGENCE

In Chapter 1, we defined performance dashboards and described their salient characteristics. In Chapter 2, we provided a business context for performance dashboards, showing how they are a critical tool in an emerging business discipline known as business performance management. In this chapter, we provide the technical context for performance dashboards by exploring the business value and composition of business intelligence (BI).

It is important to provide a primer on business intelligence because it is such an integral part of a performance dashboard. Most of the companies profiled in this book built their performance dashboard on top of a BI environment. Without business intelligence, organizations cannot exploit the full potential of a performance dashboard to focus and align people and processes with strategic objectives and make smart, timely decisions. In short, business intelligence is the foundation upon which most performance dashboards grow and flourish.

Origins of Business Intelligence

Early Days

Business intelligence emerged as a distinct discipline in the early 1990s as a way to provide end-users with better access to information for decision making. The initial goal was to give users "self-service" access to information so they did not have to rely on the IT department to create custom reports. By the early 1990s, business intelligence consisted of two nascent segments: data warehousing and desktop query and reporting tools.

Companies began building data warehouses as a way to offload queries from operational systems. Data warehouses became "analytical playgrounds" that let

users query all the data they wanted without bogging down the performance of operational systems. At the time, users needed to know SQL, a database query language, to submit queries. So, many prescient vendors began shipping query and reporting tools that hid the SQL language behind a point-and-click Windows interface. Vendors converted these desktop query and reporting tools to the Web in the late 1990s and bundled them with other types of analytical tools to create what are today called "BI suites" or "BI platforms."

The Modern Face of Business Intelligence

Taking a big picture view, business intelligence is an umbrella term that encompasses a raft of data warehousing and data integration technologies as well as query, reporting, and analysis tools (i.e., "BI tools or suites") required to fulfill the promise of giving business users self-service access to information. Performance dashboards represent the latest incarnation of business intelligence; they are built on years of technical and process innovation within the BI field and span both the data management and analytical sides of business intelligence. You could say that performance dashboards are the modern face of business intelligence.

Market Size

Today, business intelligence is big business. Almost every Fortune 2000 company has a data warehouse or some variant. Startup firms that peddled Windows-based query and reporting tools in the early 1990s are now approaching \$1 billion in revenues, offer a panoply of products and services, and boast customers around the world. Many software heavyweights, such as Microsoft, Oracle, SAP, and Siebel Systems, have also joined the fray, hoping to take a piece of the BI market's ever expanding pie.

International Data Corporation (IDC), a leading IT market research firm, predicts that the market for BI tools and applications alone will expand from \$3.9 billion in 2003 to roughly \$5 billion in 2007 with a compound annual growth rate of almost 5 percent, greater than most software market segments in recent years. Adding sales of servers and database management systems used for data warehousing, the BI market exceeds \$100 billion annually.

The ROI of Business Intelligence

Case Studies

When done right, business intelligence delivers real value. Organizations in various industries have reaped both tangible and intangible benefits from business intelligence. The Data Warehousing Institute (TDWI) receives more than 100 applications each year to its Best Practices in Business Intelligence contest from

organizations that can testify to the power of business intelligence to deliver concrete business value. Here are a few examples:

- A major airline estimates that it generated \$40 million in new revenue and saved \$31 million in costs last year from just four of 35 analytical applications running in its BI environment.
- A major electronics retailer attributes \$1.3 million a year in improved assortments and fewer out-of-stock situations to a BI solution. The same solution also saves \$2.3 million a year in inventory, a result of more accurate supplier shipments.
- A state department of finance and revenue has closed its tax compliance gap by \$10 million a year while optimizing customer satisfaction, thanks to a new BI solution.

If at First You Don't Succeed...

Although these are just a few of many hundreds of successful BI solutions, it would be misleading to suggest that every BI project generates substantial business value. Not everyone succeeds with business intelligence. It takes a considerable amount of money, time, and leadership to deliver real value. Unfortunately, many executives underestimate the commitment that they and their organizations need to make in order to ensure success.

The good news is that most organizations eventually succeed with business intelligence, even if they fail initially. In a recent survey by TDWI, only 18 percent of "stalled" BI projects were canceled outright. The rest were given another chance after restructuring the project with new sponsors, project managers, consultants, or funding levels. With the benefit of hard-earned experience, most teams eventually deliver substantial value.

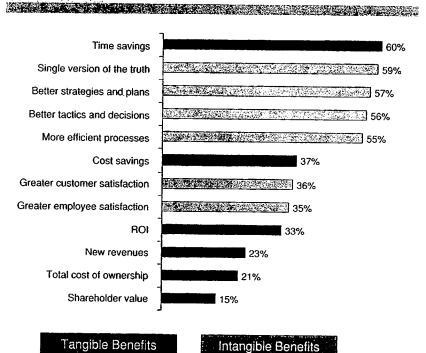
Tangible and Intangible Benefits

Organizations that deploy BI solutions cite many tangible and intangible benefits. Research shows that most benefits from BI solutions are intangible in nature, which makes them difficult to justify in terms of cost, similar to performance dashboards (see Exhibit 3.1).

Many executives report that they did not foresee the biggest benefits that business intelligence would deliver when they initially approved a project. Consequently, many executives do not insist on a rigorous cost justification.

"Our CEO is the champion of our BI project because he wants to understand what each customer means to our firm in revenue and usage," says Ted Carlson, an energy information consultant at Wisconsin Public Service. "It was difficult to pinpoint the ROI for the project—we primarily justified it as a strategic asset. It

EXHIBIT 3.1 BENEFITS OF BUSINESS INTELLIGENCE



Business intelligence delivers mostly intangible benefits, which is why it is difficult to cost justify. Based on a survey of 510 respondents by The Data Warehousing Institute, 2003.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful BI Solutions" (TDWI Report Series, The Data Warehousing Institute, 2003).

has played a big role in attracting and retaining customers and keeping our stock price and credit rating at high levels compared to the rest of the industry."

BUSINESS INTELLIGENCE LANDSCAPE

Conceptual Framework

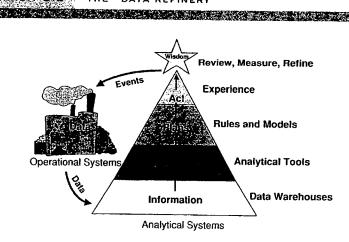
Business intelligence is often used as a synonym for query, reporting, and analysis tools. However, the term *business intelligence* is broader than a set of software tools. A better definition is as follows:

Business intelligence consists of the processes, tools, and technologies required to turn data into information and information into knowledge and plans that drive effective business activity.

Given this definition, performance dashboards based on a BI infrastructure provide more than just a visual display of performance metrics. They are powerful tools for transforming companies into learning-based organizations that use fact-based decision making to achieve strategic objectives.

One way to think about business intelligence is as a "data refinery." To understand this analogy, think of an oil refinery, which is designed to take a raw material—crude oil—and process it into a multiplicity of products, such as gasoline, jet fuel, kerosene, and lubricants. In the same way, business intelligence takes another raw material—data—and processes it into a multiplicity of information products (see Exhibit 3.2).

The cycle begins when operational systems that "run" the company—such as order entry, shipping, billing, general ledger, and so on—capture business events and turn them into data, the raw material of business intelligence:



Business intelligence can be thought of as a "data refinery" that processes a raw material—data—into a multiplicity of information products: "Information," which is collected and aggregated by data warehouses; "Knowledge," which is gleaned from query, reporting, and analysis tools; "Plans," which are pieced together from rules, models, and patterns discovered by analytical tools; and "Action," in which business users execute plans that generate events, which starts the cycle over again.

- 1. Data to Information. A data warehouse captures data from one or more operational systems and integrates it at the "atomic" level—the most granular level of data that exists among all systems. For example, a data warehouse might match and merge product data at the SKU level from four operational systems—orders, service, sales, and shipments systems. Integrating data and storing it in a single place transforms data into a new product: information.
- 2. Information to Knowledge. Then, users equipped with query, reporting, and analysis tools examine the information and identify trends, patterns, and exceptions in the data. Analytical tools enable users to turn information into a new product: knowledge.
- 3. Knowledge to Rules. Armed with these insights, users then create rules from the trends and patterns they discover. These rules can be simple—"Order 50 new units whenever inventory falls below 25" or "We expect to sell 1,000 widgets next month based on our past three months of sales and year-to-date comparisons." The rules can also be complex, generated by statistical algorithms or models. For example, statistically generated rules can dynamically configure prices in response to changing market conditions, or optimize freight-hauling schedules in a large carrier network, or determine the best cross-sell opportunities for use in a call center or Web site.
- 4. Rules to Action. Users then create plans that implement the rules. For example, a marketing manager may create a marketing campaign that provides unique offers to customers in six market segments using an optimal combination of marketing collateral and incentives for each customer. The campaign defines what offers to make to each customer segment and the channels (e.g., direct mail or e-mail) through which the offers should be sent. Plans turn rules into action.
- 5. Feedback Loop. Once plans are executed, they generate business events that are captured by operational systems, repeating the process. Each time an organization goes through this cycle, it measures, reviews, and refines its plans. This allows users to refine both their mental and statistical models of how the business works and how their decisions affect performance.

This five-step virtuous cycle—in essence, capture, analyze, plan, act, and review—creates a learning organization that can respond flexibly and nimbly to new events in the marketplace.

In many respects, business intelligence is designed to mimic the processes that humans use every day to learn and to make judicious decisions. During our lifetime, we experience millions of events that we assimilate, analyze, and turn into rules, whether consciously or not. Each time we apply a "rule," we get feedback on its validity, which enables us to refine the rules and adapt to changes in our environment. Our "gut instincts" are no more than the unconscious application of rules refined from millions and millions of life experiences. In the same way, business intelligence uses technology to turn millions of business events into models that an organization can use to adapt quickly to changing market conditions.

Common Misconceptions

Some executives make the huge mistake of thinking that there is no difference between BI systems and operational systems. Many executives do not believe they need to spend hundreds of thousands or millions of dollars to create a BI system when their operational systems already generate reports and when business analysts create custom reports in Excel or Access for them.

Eventually, reality catches up with these organizations. They become extremely inefficient in gathering and analyzing data, wasting hundreds of thousands of dollars in man-hours every year. Even worse, they make bad decisions based on incomplete, inconsistent, or inaccurate data, leading to millions of dollars in lost sales. The sad thing is that most organizations do not realize the extent to which they are bleeding themselves dry because of the lack of business intelligence! This is because no accountant or auditor tracks how much money the company loses each day or week or month by not providing timely, consistent data to all workers who need it.

Business Intelligence Is an Adaptable System

The major difference between the two types of systems is that BI systems adapt to the business whereas operational systems structure it. BI systems need to adapt continually to the changing concerns of the business. The questions that business users ask today are different from the ones they will ask tomorrow or next week. In contrast, operational systems impose structure on the business so that a process, such as order taking, is done the same way every time no matter who takes the order. Once designed, operational systems do not change much. The opposite is true for BI systems: the more they change, the more value they provide. In short, whereas operational systems automate processes to improve efficiency, BI systems support decision making to improve effectiveness (see Exhibit 3.3).

So, the real challenge of business intelligence is how to design and manage a system that always changes. In other words, how do you create an adaptive system? This is not easy, which is why many experts say that building a BI system (or a data warehouse) is a "journey, not a destination."

Operational Systems	Business Intelligence
Automate processes	Support decision making
Designed for efficiency	Designed for effectiveness
Structure the business	Adapt to the business
React to events	Anticipate events

Optimized for transactions

Types of Data

The dichotomy between operational and BI systems is also evident in the type of information that each manages (see Exhibit 3.4). Operational systems track current transactions (e.g., debits, credits, and current account balance) and keep little history around (i.e., usually only 60 to 90 days of transactions). In contrast, BI systems maintain *years* of detailed transactions culled from multiple operational systems. Moreover, BI systems create new or derived data by summarizing and calculating transaction data to support the metrics that the business uses to track performance.

Optimized for queries

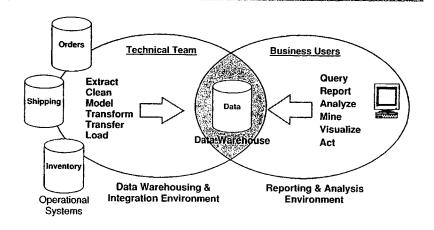
Operationalizing Business Intelligence

Until recently, BI systems captured transactions by taking periodic "snapshots" of data in an operational system at regular intervals. Now, however, companies want to analyze more timely or "fresher" data to make operational or right-time decisions. For example, store managers who can analyze product sales hourly or daily might change product displays twice a day to optimize revenues by analyzing hourly shopping trends. To support this type of decision making, BI systems are

OPERATIONAL DATA VERSUS BI DATA

Operational Data	Bi Data
Current	Historical
Continuously updated	Periodic snapshots
Source specific	Integrated
Application oriented	Subject oriented
Detailed only	Detailed, summarized, and derived

BUSINESS INTELLIGENCE TECHNICAL FRAMEWORK



Business intelligence consists of two intersecting environments represented by the ovals above: the data warehousing and integration environment and the reporting and analysis environment.

beginning to adapt the characteristics of operational systems noted in Exhibits 3.4 and 3.5. We will discuss right-time BI in more detail in Chapters 6 and 7.

Technical Framework

Now that we understand the conceptual basis of business intelligence, let us explore the components that comprise a BI environment. The diagram shown in Exhibit 3.5 depicts business intelligence as two intersecting ovals, with operational systems (e.g., orders, shipping, and inventory) off to the left.

Data Warehousing and Data Integration Environment

Data Archaeology

In Exhibit 3.5, the left-hand oval is the data warehousing and integration environment. This is where the technical team spends 60 to 80 percent of its time. Its job is to capture, clean, model, transform, transfer, and load transaction data from one or more operational systems into the data warehouse. These tasks are not easy because operational data is rarely clean, consistent, or easy to integrate. Like archaeologists, the technical team needs to decipher the meaning and validity of thousands of data elements and values in multiple operational systems. It then needs to glue everything back together again into a single coherent "model" of the

business, much like a paleontologist might reconstruct a life-size model of a dinosaur from an assortment of bones.

Needless to say, these tasks take a tremendous amount of time and effort. Just as it takes years for a paleontologist to piece together a dinosaur from its relics, it can take months for a technical team to create an initial data warehouse or data mart. This is why most teams start small and incrementally build an enterprise view one subject area at a time. Also, just as paleontologists need expert knowledge of their subject matter, technical teams need a deep understanding of the business they are trying to model. In fact, technical teams cannot do this work themselves. They need business analysts who are intimately familiar with both the business and the data to guide them step by step through the process of gluing the business back together again.

Data Warehouses

Once the data archaeology is complete, the technical team loads the integrated data into a data warehouse, which is usually a relational database designed to handle large numbers of both simple and complex queries. A simple query might ask for the customer record for "John Doe," which was pieced together from multiple systems and stored in one row of the data warehouse database. A complex query might ask to see the top 10 customers for the previous 12 months who have outstanding credit but declining orders. Whereas simple queries take seconds to execute, complex queries can take many minutes or hours depending on the complexity of the query and the volume of data in the data warehouse.

Data Marts

To improve query performance and narrow the scope of data warehousing projects, technical teams often create subject-specific data warehouses, called data marts. Data marts became popular once it became clear that early data warehousing projects that tried to model and map large portions of the enterprise took years to build, cost millions of dollars, and, not surprisingly, failed to deliver meaningful results. Data marts scale down projects to a realistic scope, allowing technical teams to deliver results within three to six months. Typical data marts are designed to support individual business areas, such as sales, marketing, or accounting.

Most data warehouses are modeled in a highly normalized format, such as third normal form, which minimizes redundancy in the database by dividing data into tables and specifying relationships between them. Third normal form models are commonly used in transactional systems so applications only have to access a single table to make an update instead of multiple tables, increasing application speed and accuracy.

In contrast, most data marts are designed using a star schema model, which arranges relational data so that it is easy and fast to query and quick to load into online analytical processing (OLAP) cubes. Unlike normalized models, a star schema puts all the fact-based information (e.g., the numbers) in a central table surrounded by multiple dimension tables, such as customer, geography, channel, product, which is why it is called a "star" schema. The dimension tables filter the central fact table in response to a user query, such as "I want to see revenues (i.e., a "fact") for the last 12 months (i.e., time dimension) in the Midwest region (i.e., geography dimension), by our top 10 customers (i.e., customer dimension ranked)."

Multilayered Architecture

Today, most companies use a hub-and-spoke architecture to meet users' information needs. This architecture consists of a central data warehouse that feeds information to multiple downstream data marts. In this environment, users query the data marts, which are designed to meet the specific information requirements of a department or workgroup. Only data-savvy business analysts query the data warehouse, which contains a superset of information in the marts.

The use of data marts frees technical teams to design a data warehouse to handle two major tasks: 1) collect and integrate data from multiple systems at the most granular level possible and 2) prepare and distribute data to data marts. The data warehouse never gets rid of data and serves as a perpetual recycling center and staging area. This multitiered architecture enables technical teams to create new data marts quickly by repurposing data already in the warehouse and perhaps extracting new data from operational systems either periodically in a batch process or in near real-time using enterprise information integration (EII) tools. However, not all data warehousing experts believe that a multi-tier architecture is best (see Spotlight 3.1).

SPOTLIGHT 3.1 DATA WAREHOUSING ARCHITECTURES: THE BATTLE OF THE TITANS

The BI community has experienced its share of religious wars over the years: The biggest battle has been waged over how to construct a data warehousing environment.

The Inmon Model. The Inmon model, named after Bill Inmon, a prolific author and respected figure in data-warehousing circles, advocates using a "hub-and-spoke" architecture in which a central data warehouse serves as a staging area to collect data from multiple sources systems and then distribute subsets to downstream data marts. In this multiple approach, users query data marts instead of the data warehouse, which functions more as a staging area and distribution center. The data warehouse contains detailed data whereas the data marts contain mostly summary data.



SPOTLIGHT 3:1 (CONTINUED)

The Kimball Model. Another major camp follows the advice of Ralph Kimball, another prolific author and respected figure in the industry. The Kimball model dismisses the need for a data warehouse. Because most users want detailed data, Kimball argues that it is best to store the detailed data in individual data marts and logically connect them using "conformed" dimensions. In essence, Kimball's data warehouse is the sum of all the data marts. To optimize query performance and improve ease of use of the data marts, Kimball popularized a type of data model known as a star schema that is widely used today, even among "Inmonites" when creating data marts.

Centralized Data Warehouse Model. Teradata, a division of NCR, advocates using data warehouses without any data marts. This centralized approach gives users unfettered access to all data in the data warehouse instead of restricting them to individual data marts. It also makes it easier to manage and maintain the system because all the data are kept centrally within a single data management platform. However, central data warehouses can become extremely large in terms of the amount of data and number of users they support. To maintain adequate query performance in large central warehouses, organizations need a high-performance, parallel-processing database. (such as the one Teradata provides).

Federated of Virtual Approach. The federated approach creates a virtual data warehouse. Instead of consolidating data into a single repository, this approach pulls data together on the fly from multiple source systems, including data warehouses, data marts, operational systems, Web pages, and external systems, among other things. From the user's perspective, however, the data appear to exist in a single system since the federated approach delivers a virtualized view of remote systems. Users aren't aware of the complexity of the data environment, although some complex queries may not run as fast as in a traditional environment.

Although the federated approach does not always scale well, it is a quick and easy way to get a performance dashboard up and running when an organization either does not have a data warehouse or data mart or does not want to wait for the IT department to upgrade an existing one with the right data. An organization can use the technique to populate metrics in a performance dashboard with data from different systems. For instance, it can pull budget data from a planning system, last month's results from the data warehouse, and yesterday's activity from an operational system. Many organizations now prefer the flexibility of the federated approach, and it is one reason for the explosion of performance dashboards today.

Research from TDWI shows that most organizations prefer inmon's multilayered, "hub and spoke" approach to either a central data warehouse or a Kimball architecture. Interestingly, these approaches are not mutually exclusive. Most organizations create hybrid architectures that blend elements from each. In reality, there is no one right or wrong way to build a data warehouse as long as it meets an organization's information needs.

Operational Data Stores

To confuse matters, many organizations create a specialized data warehouse, known as an operational data store (ODS), to support operational applications that require fast access to integrated data. Unlike traditional data warehouses or data marts that store large volumes of historical data and support complex, long-running queries, ODSs do not store more than a few months of data and support quick look-up queries (e.g., customer records.) In addition, users can update records in the ODS but not the data warehouse, which typically appends new information to existing records but never throws anything out in order to keep a true historical record of events.

A good example of an ODS is a customer database that delivers a customer record to a telephone service representative when the customer calls with a question or an order. The customer record contains a history of customer purchases and past interactions with the company culled from multiple customer-facing systems. It may also contain a "score" that informs the customer service representative what products to cross-sell to the customer based on their buying history. (The scores are usually calculated in the data warehouse and passed to the ODS.) In addition, whereas data warehouses are read-only environments, an ODS lets business users edit or delete records on the fly. For example, a service representative can update a customer's address, marital status, or other information within the ODS while on the phone with the customer.

Data Warehousing Tools

To build a data warehousing environment, technical teams must first analyze source systems to see what data they contain and also examine the condition of the data. Often, source systems contain incomplete, missing, or invalid data, which makes it challenging to build a data warehouse. Most teams now use data profiling tools to audit and assess the condition of source data and identify relationships among columns and tables. They use data cleansing tools to validate and fix known problems in source data as it is loaded into the data warehouse.

Once the team finishes analyzing the data in source systems, it creates a target data model for the data warehouse. The model, in effect, is a logical representation of how the business operates in a specific area, such as sales or service. Most technical teams create conceptual, logical, and physical data models using commercially available data modeling software, although some data modelers still work entirely by hand.

Data Integration Tools

With a target model in hand and a good understanding of data in source systems, the team is now ready to map source data to the target data warehousing model.

It does this by using extraction, transformation, and loading (ETL) tools or by coding transformation logic by hand. ETL programs are the heart and soul of a data warehousing environment because they contain all the rules for gluing data from multiple source systems into a single data store that provides an integrated picture of the business. ETL tools also contain engines that automate the process of extracting source data, transforming and mapping it to the target model, and moving and loading it into the data warehouse.

To support right-time or even real-time updates, a performance management group may also employ high-speed middleware in conjunction with their ETL tools. For example, organizations that use enterprise application integration (EAI) to integrate packaged and legacy applications are now pushing data to ETL engines in real time. This "trickle feed" approach replaces traditional batch-loading processes that limit data warehouses to storing historical data only. The combination of EAI and ETL promises to transform data warehouses from stodgy historical archives into active repositories of on-demand information.

Another way to deliver right-time information is to use enterprise information integration (EII) middleware. These tools query multiple, distributed data sources, join the results on the fly, and display them to end-users. EII tools, in effect, create a virtual data warehouse or virtual performance dashboard that is dynamically generated transparently to users. However, many EII tools only work well against small volumes of clean, relatively non-volatile data that have well-defined database keys. Most experts agree that EII tools provide a good way to prototype the contents of a proposed data warehouse or performance dashboard or supplement an existing one with right-time or external data.

Lightweight Infrastructure

Not all performance management systems require organizations to build data warehouses and deploy data integration middleware, which can be expensive. Some strategic dashboards succeed without them. However, just because an organization does not want to spend money creating a BI infrastructure does not mean it can succeed without it (see Spotlight 3.2).

SPOTLIGHT 3.2 DO WE REALLY NEED A BI INFRASTRUCTURE?

Some executives who want to deploy a performance dashboard balk at the cost and complexity of creating a BI infrastructure, including data warehouses, data marts, and data integration tools. They question whether these tools and structures are absolutely critical and wonder if there is a shortcut.



SPOTLIGHT 3.2 (CONTINUED)

It is true that not all performance management systems require a BI infrastructure. Chapter 1 described a strategic dashboard built by Brown & Root that did not hold much data and thus didn't require a classic BI infrastructure. However, just because an organization does not want to spend money on a BI infrastructure does not mean it can get away without one.

Most operational and tactical dashboards require a BI infrastructure, but strategic dashboards may not need one right away. However, once a company starts cascading scorecards throughout the enterprise and to lower levels of the organization, its information requirements expand substantially and it will need to invest in a BI infrastructure. Lower level scorecards generally require more detailed data than higher level scorecards.

Organizations that put off building a BI infrastructure create problems for themselves in the long run. They usually hit a brick wall once they try to expand the performance dashboard beyond the initial target group of users. Successful projects are cursed with success and the team must support three to four times more data and users than they anticipated. When this happens, the team often quickly slaps together a BI infrastructure that is not reliable, scalable, or aligned with corporate information standards. These makeshift BI infrastructures are costly to maintain and are prime candidates for consolidation into a more standard infrastructure.

A robust BI infrastructure does not have to cost a fortune, and it does not have to be built all at once. Many companies profiled in this book bootstrapped their performance dashboards with little or no money and without making long-term technical compromises at the infrastructure level. Most built the BI infrastructure incrementally along with new applications and functionality requested by users. Some also leveraged existing data warehouses and data marts, accelerating development and avoiding duplication of resources.

Analytical Environment

The right-hand oval in Exhibit 3.5 refers to the reporting and analysis environment, which is the domain of the business users, who use a variety of tools to query, report, analyze, mine, visualize, and, most importantly, act on the data in the data warehousing environment.

Report Design Tools

Report design tools allow power users or developers to craft custom queries and format the results in a standard report layout, such as master-detail reports or pixel-perfect invoices and account statements. A decade or two ago, most standard business reports were hand-written using a programming language, printed on paper, and distributed via snail mail. However, vendors now offer powerful new report design tools that run on a variety of platforms (e.g., Windows, Web,

mainframe) and pull data from multiple source systems. The tools now generate online reports that users can interact with by linking to subreports (i.e., "linked reports") or selecting parameters from a drop-down list box (i.e., "parameterized reports"). Many report design tools now use a desktop publishing paradigm that makes it easier for report developers and power users to create custom reports quickly and easily.

The earliest report design tools exhibited many characteristics of modern day data warehouses and data integration tools. They extracted, joined, and massaged data from multiple source systems, placed the data into a large report file, and stored it on a central server. Many financial, management, and regulatory reports are still produced this way. Unfortunately, many executives mistake their 15-year-old production reporting systems for a full-fledged business intelligence environment. They believe that because they spend hundreds of thousands of dollars each year producing standard reports they already "do" business intelligence. It is difficult to convince these executives that they are losing money and a competitive edge by not giving users timely access to relevant information, something that most standard and production reports do not deliver.

Whereas early report design tools created static reports, many now create interactive reports that function similarly to end-user query and reporting tools. For example, parameterized re-ports make users think they are performing ad hoc queries when, in reality, they are simply filtering a preexisting report. A single parameterized report with multiple filters can replace hundreds or thousands of custom reports, liberating end-users from having to request custom reports from the IT department (see Exhibit 3.6).

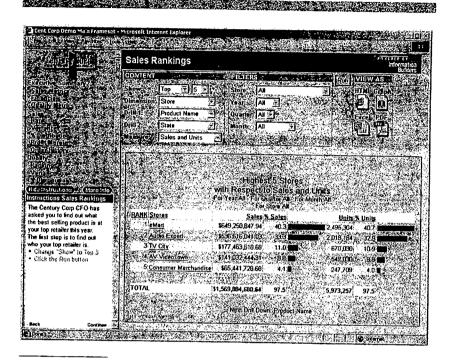
Query and Reporting Tools

End-user versions of report design tools are known as query and reporting tools. These tools provide users with predefined query objects that shield users from having to know SQL or master the complexity of navigating back-end databases and networks. With a semantic layer, end-users simply drag and drop data elements and measures onto a "query panel" and hit the submit button. The results come back in rows and columns (i.e., tabular format) that users can then turn into charts or apply other formatting as needed. Business Objects and Cognos were among the first vendors to deliver end-user query and reporting tools.

Online Analytical Processing Tools

OLAP tools are essentially spreadsheets on steroids. Whereas spreadsheets store data in two dimensions in a file, OLAP tools store data in multiple dimensions in a specialized database (see Exhibit 3.7). The beauty of OLAP tools is that they let users query data the way they think about the business—dimensionally. Whereas





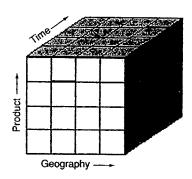
Parameterized reports let users filter an existing report by selecting values from one or more dropdown list boxes, as in the example above. With parameterized reports, users think they are performing "ad hoc queries" when they're really just applying filters to an existing report. Parameterized reports let developers create one report that provides many views or slices of the data.

Source: Courtesy of Information Builders, Inc.

query and reporting tools require users to select tables, rows, and columnswhich are the artifacts of databases-OLAP tools let users select measures and dimensions—which are artifacts of the business. A typical OLAP query might be "Let me see net profits by product, by channel, by geography, and by time." Like spreadsheets, OLAP tools let users apply complex calculations to the data and create hierarchies within each dimension. A geography hierarchy might be Region, Country, District, City, or Office. A time hierarchy might be Year, Quarter, Month, Week, or Day.

Unlike spreadsheets, however, OLAP tools hold much more data because they run on a specialized multidimensional database. OLAP tools are fast-they provide split-second response times to most queries, allowing users to "slice and dice"

EXHIBIT 3.7 OLAP CUBE: DIMENSIONAL ANALYSIS



OLAP tools are like spreadsheets on steroids. Whereas spreadsheets store data in two dimensions, OLAP tools store data in multiple dimensions. Users can quickly and easily navigate through dimensions and hierarchies in the cube, hence the term "slice and dice." The diagram above only shows three dimensions, but OLAP cubes can hold dozens of dimensions, each with multiple hierarchies of data.

the data almost at the speed of thought. Interestingly, most users cannot tell the difference between a parameterized report and an OLAP application. Both provide flexible navigation. The major difference is that OLAP users navigate a dimensional database whereas parameterized report users navigate query filters defined by a report designer. Thus parameterized reports are ideal when you want to impose greater structure on user navigation, whereas OLAP is best when you want to give users unfettered access to a predefined set of data.

The traditional downsides of OLAP databases are that they only hold a limited amount of data (but much more than a spreadsheet) and they run on a proprietary database that may not match your company's architecture. Traditionally, OLAP tools take a long time to populate with data because they precalculate results at the intersection of each dimension and each hierarchy. This effectively limits them to storing summary data only. However, in recent years, vendors have made dramatic breakthroughs in OLAP server scalability and calculation performance. Many companies are now considering replacing star schema data marts with OLAP servers because they are equally scalable.

Data Mining Tools

Data mining tools, also known as knowledge discovery in databases (KDD), provide highly specialized tools for statisticians and skilled business analysts. These

tools automatically "mine" or discover patterns in the data and generate statistical models and rules. Unlike query, reporting, and analysis tools that require users to start with a hypothesis of trends in the data, data mining tools do not require business users to make such assumptions.

Using sophisticated statistical analysis and data mining techniques, such as neural networks, decision trees, and linear regression, these tools find patterns in the data that might take days or weeks for users to discover on their own, if at all. Some vendors now sell text mining tools that discover patterns in documents or text, such as call center conversations, Web forums, or Web pages. Both data and text mining tools turn the patterns into rules or algorithms (i.e., "models") that can be applied to other data to make predictions, classifications, segmentations, recommendations, and forecasts. For example, companies use data mining models to spot fraudulent credit card transactions, anticipate machinery breakdowns, or recommend products to new or existing customers.

The ROI of predictive mining applications is almost five times greater than that of nonpredictive applications using standard query, reporting, and analysis tools, according to research firm IDC. The downside is that data mining applications require high-priced specialists and software that make them almost twice as expensive to set up and maintain as other analytical applications, according to IDC.

Fitting Users to Tools

One Size Does Not Fit All

The five categories of BI tools described above—report design, end-user query and reporting, OLAP, and data mining—deliver different types of functionality for different types of users. To meet user requirements, organizations must purchase multiple BI tools, something most executives are loath to do. For years, executives have made it abundantly clear that they only want to purchase one tool for all users to minimize upfront license fees and downstream maintenance, support, and training costs. The reality, however, is that one size does not fit all when it comes to BI tools.

To date, companies that have purchased a single BI tool for all users pay in the end. Users get frustrated with BI tools that are over- or underpowered for their needs and stop using them. There is a lot of BI shelfware today, representing hundreds of millions of dollars in wasted investments. The beauty of performance dashboards is that they support a broad range of users by incorporating the functionality of a variety of BI tools in a layered fashion that conforms to the way users want to view and manipulate information. Performance dashboards finally give executives a single tool that meets the needs of most users in their organizations.

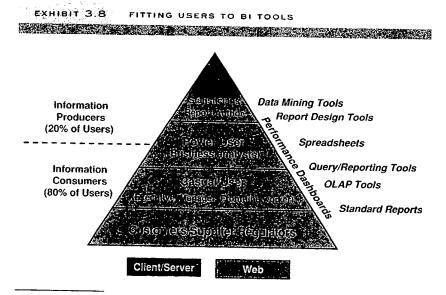
Outside of performance dashboards, many BI vendors sell integrated suites of BI tools, which meet most users' requirements and minimize the risks of pur-

chasing BI tools, although they generally increase upfront license fees. However, even when purchasing a performance dashboard or BI suite, organizations need to assess user requirements to ensure that they display the right functionality in a performance dashboard or outfit users with the right modules in a BI suite. To do this, organizations need to segment users into categories based on their analytical habits and requirements. Most organizations have between four or eight distinct categories of BI users. Once these profiles are known, organizations can then assign the right BI tool to each type of user.

Exhibit 3.8 provides a simple framework for mapping users to BI tools. The framework divides all users into two categories: 1) information producers, who create reports and views for others to view and 2) information consumers, who consume those reports and views.

Information Producers

Information producers comprise 20 percent of the total user population and generally use desktop tools to create reports or models. Information producers consist of statisticians, who use data mining tools, and report authors, who use report



This diagram provides a simple framework for classifying types of business intelligence users and fitting them with appropriate BI tools. The beauty of performance dashboards is that they support the broadest range of users by incorporating the functionality of a variety of BI tools in a layered fashion that conforms to the way users want to view and manipulate information.

design or programming tools to create custom reports. Report authors can be IT developers or "power" users—business users who taught themselves how to use a report design tool or were trained by the IT department. Because power users both create and consume reports, they straddle the line between information producers and information consumers. The most typical type of power user is a business analyst, who uses Microsoft Excel and Microsoft Access to analyze data and build custom reports.

Information Consumers

Most information consumers are *casual users* who regularly view reports but do not crunch numbers or perform detailed trend analysis on a daily basis. Casual users include executives, managers, staff, and external users. This is a large group that is well served by a performance dashboard, which encompasses query and reporting tools, OLAP tools, spreadsheet reports, standard reports, and the output of statistical models. Most of these tools now provide a Web interface to promote ease of use and minimize administration and overhead.

Promise and Reality of BI Tools

When BI tools made their debut in the early 1990s on Windows desktops, there were high expectations that the tools would liberate end-users from their dependency on the IT department to create custom reports. The combination of these tools and newly minted data warehouses caused vendors and pundits to proclaim that the era of "self-service" business intelligence had arrived.

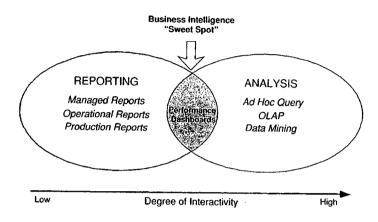
However, reality quickly fell short of promise. It turns out that most users found the tools too difficult to use. Even when the tools migrated from Windows to the Web, simplifying user interfaces and easing installation and maintenance burdens, it was not enough to transform Bl tools from specialty software for power users to general-purpose analytical tools for everyone in the organization.

Even power users abused the early generations of BI tools (and still do!). Most use BI software as glorified extraction tools to download huge data sets to their desktops, clogging networks and bogging down query performance for everyone else. These users then dump the data into Microsoft Excel to do their "real" analysis, creating spreadmarts that undermine data consistency and a single view of the business.

New Wave on the Way

However, a new wave of BI tools has arrived: performance dashboards. These next-generation BI tools blend the once distinct worlds of reporting and analysis behind a dashboard or scorecard interface. These tools hit the BI "sweet spot"

EXHIBIT 3.9 BUSINESS INTELLIGENCE "SWEET SPOT"



Performance dashboards blend the attributes of reporting and analysis to create a dynamic or "drillable" exception report that meets the needs of 80 percent of your workforce.

by delivering the information and functionality that most users in an organization want and need to do their jobs effectively (see Exhibit 3.9).

The information needs of these users are best summed up in the mantra: "Give me all the data I want, but only the data I really need, and only when I really need it." In other words, most users don't want to spend unnecessary time analyzing data unless there is an exception condition that demands their attention. When that happens, they want immediate access to all relevant information, but in a systematic and structured way so they don't get lost in the data.

Key Features

Performance dashboards support the "user mantra" by providing only the information users need when they need it. Performance dashboards do not overwhelm users with a dizzying array of reports or analytical options; they keep things simple by highlighting anomalies in a graphical interface and giving users the option to investigate the details if they desire.

In essence, performance dashboards are "prettified" exception reports with built-in analytical tools that make it easy and fast for users to examine information about an exception condition. In short, performance dashboards conform to the way users want to work instead of forcing them to conform to the way the tools work.

SUMMARY

Business intelligence is the foundation upon which performance management systems grow and flourish. Without business intelligence, organizations cannot exploit the full potential of a performance dashboard to focus and align people and processes with strategic objectives and optimize performance. Business intelligence consists of a data warehousing environment and a reporting and analysis environment.

Data Warehousing and Integration. Technical teams use a variety of data integration tools to populate a data warehousing environment, including tools that capture data in real time directly from source systems. Although most organizations use a multitiered architecture, there are numerous ways to build a data warehousing environment. The reporting and analysis environment allows endusers to query, report, analyze, mine, and act on data in a data warehousing environment.

Reporting and Analysis. Although there are many reporting and analysis tools, no one tool will fit all users in an enterprise. Organizations need to purchase different tools for different categories of users according to their analytical requirements and abilities. Although every organization classifies users differently, there are two basic categories of users: information producers, who create reports, and information consumers, who consume them. Within these categories are multiple segments, each of which has slightly different requirements and needs. Organizations need to fit BI tools carefully to users; otherwise users will not use the tools.

The New Face of Business Intelligence. Performance dashboards represent the latest incarnation of business intelligence, building on years of technical and process innovation. Performance dashboards meet the information requirements of most casual users by hitting the business intelligence "sweet spot," which blends reporting and analysis capabilities within an intuitive dashboard interface. Performance dashboards deliver on the promise of self-service data access by providing the right data to the right people at the right time to optimize decisions and accelerate results. In short, performance dashboards are the modern face of business intelligence.



Assessing Your Organizational Readiness

READINESS CRITERIA

Performance dashboards cannot take root in a hostile environment. The organization must be ready to accept and nurture a performance dashboard for it to succeed.

Paul Niven, author of Balanced Scorecard Step by Step: Maximizing Performance and Maintaining Results, defines seven criteria for evaluating an organization's readiness to implement a Balanced Scorecard. Although Niven created these criteria specifically for Balanced Scorecards (i.e., strategic dashboards), they are equally valid for any kind of performance dashboard.

I have adapted Niven's list and added three criteria to reflect the importance of having a solid business intelligence (BI) infrastructure to support all types of performance dashboards, not just strategic ones. Although some strategic dashboards do not initially require an investment in BI and data integration software, most eventually do, as explained in Chapter 3. Therefore, the following ten criteria are good ways to evaluate an organization's readiness to deploy and sustain a performance management system for the long haul.

To evaluate readiness, ask whether your organization has:

- 1. A clearly defined strategy
- 2. Strong, committed sponsorship
- 3. A clear and urgent need
- 4. The support of mid-level managers
- 5. The appropriate scale and scope

- 6. A strong team and available resources
- 7. A culture of measurement
- 8. Alignment between business and IT
- 9. Trustworthy and available data
- 10. A solid technical infrastructure

Let us describe each of these criteria in detail and then use them to create an assessment tool to evaluate organizational readiness.

1. A Clearly Defined Strategy

A performance dashboard is a window into an organization's strategy and planning processes, especially a strategic dashboard. If the strategy and planning processes are unclear, unaligned, or uncoordinated, the performance dashboard will be ineffective and short lasting. For example, Hewlett Packard Co.'s Technology Solutions Group (TSG) asks business sponsors a series of questions to ascertain whether their group or unit has a measurable strategy and a culture of measurement before creating scorecards for them (see Spotlight 4.1).

SPOTEIGHT 4.1 STRATEGIC DASHBOARD READINESS ASSESSMENT

Hewlett Packard Co.'s Technology Solutions Group (TSG) has a program office that creates strategic dashboards for its regional groups and other units. When working with a new group, the program office first meets with the sponsoring executives to explain strategic dashboard concepts and discuss their concerns. To assess the group's readiness to use a strategic dashboard approach to manage performance, the program team asks executives to answer the following six questions:

- 1. Is the relationship between your strategy and measures clear and obvious? This question communicates the need to translate strategy into a small number of carefully defined metrics with corresponding objectives, targets, and initiatives. Most companies have hundreds of metrics, most of which they rarely consult and few of which are truly relevant to their mission.
- 2. Do you measure outcomes or causes? This introduces executives to the concept of "leading" and "lagging" indicators and gets them to start thinking about measuring value drivers instead of historical activity.
- 3. Is there consensus about the importance of the measurements and objectives? Do all executives agree that existing metrics accurately define the strategy? If the strategy and vision are vague, the answer is usually "no." Second, do employees agree that the metrics used to evaluate their performance are valid and produce the desired results? Without employee buy-in, a performance management system cannot work.



SPOTLIGHT 4.1 (CONTINUED)

- 4. If you select ten managers at random, how many know whether they are helping to achieve the strategy? Most managers and workers know what tasks they need to do each day, but few know how their work contributes to the company's strategy. This helps executives see that the strategic dashboard is a communications tool that lets employees literally "see" how their work contributes to the strategy and performance of the company.
- 5. Is important information easy and readily available for the right people? It is one thing to measure performance, but it is another thing to empower people with information so they can take action to improve performance. This helps executives assess the state of their information delivery systems and whether they need to be overhauled.
- 6. What do you do with the figures you receive? This can be a gut-wrenching question. A strategic dashboard broadcasts performance results so managers can compare themselves with their peers and no longer hide behind well-scrubbed spreadsheets. Many executives will be threatened by the free flow of performance data required in a successful implementation.

The organization must have a strategy that defines its mission, values, vision, goals, and objectives, as well as metrics for measuring progress toward reaching those objectives. It also needs a planning process that devises new initiatives, refines existing ones, and allocates resources to implement the strategy. The following are the major components of a strategy.

Mission

A mission statement communicates the purpose of a business to people both inside and outside the organization. In about 50 words or less, a mission statement describes what the company does, how it differs from the competition, and its broadest goals. It communicates to employees and the outside world the reason for the organization's existence. To define a mission statement, Niven recommends the "Five Why's" technique developed by Collins and Porras. An individual crafts a short description of what the organization does and then a facilitator asks "Why is this important?" five times. Each answer refines the description until it becomes a powerful and pithy encapsulation of the company's mission.

Goals and Objectives

Goals and objectives define the path a business takes to achieve the mission. They state what the company is committed to doing and, more importantly, what it will not do. Goals and objectives are the heart of any strategy statement. They

should be aligned with the mission statement and disseminated widely. Specifically, goals are the major aims of the company or the broad results it wants to achieve, whereas objectives are the steps it takes to reach each goal. Goals are generally stated without much detail. They are ambitious but realistic, motivating employees, not demoralizing them. Objectives, on the other hand, are more narrowly defined. They specify targets, time frames, and measures for each goal. Objectives are revised regularly as the business changes.

Values

Values reflect the principles and beliefs that guide the way the company does business. Values are shared assumptions about how things should get done. Values are very important in a crisis situation when a new and unique situation confronts the company and it must decide how to act. For example, values helped executives at Johnson & Johnson decide to quickly pull every bottle of Tylenol from retail shelves when several were found to be contaminated with cyanide, an act that cost the company more than \$100 million. However, its rapid action to safeguard the lives of the public ultimately garnered tremendous goodwill and public respect, which helped to minimize the impact of its financial losses.

Vision

The vision statement describes where your company wants to go or what it wants to become. It is inspiring, a call to action. Whereas goals represent what a company hopes to achieve in the near term, a vision shows where the company plans to be in 5, 10, or 15 years. The vision represents the company's "stretch" goals. Think of John F. Kennedy's speech, when he called for the country to send a man to the moon by the end of the decade. This challenge galvanized the country, which rose to the task and achieved the seemingly impossible.

Metrics and Targets

A critical part of a strategic planning session that most companies overlook is the task of translating strategy (i.e., mission, goals, objectives, values, and vision) into metrics and targets that can be tracked over time. Without such metrics and targets, companies have no idea how well their strategy is being carried out in the field and cannot make course corrections to stay on track. Chapter 11 goes into detail about how to craft metrics and targets for performance dashboards.

Planning

Planning translates strategy into initiatives at the local level and allocates resources to various groups to carry out the initiatives. When plans and budgets are tied to

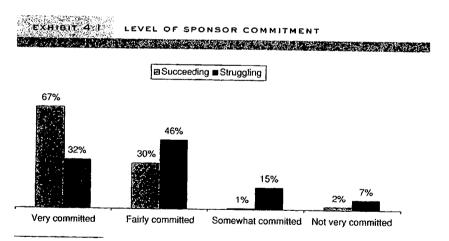
strategic objectives, the business moves collectively toward the same goals and destination. One way to do this is to reevaluate group and individual plans on a quarterly basis. Such continuous planning gives an organization greater flexibility to adapt to changes and opportunities in the marketplace.

2. Strong, Committed Sponsorship

It is almost an industry cliché to say that strong business leadership is critical to the success of any information management project, including performance dashboards. A committed and involved business sponsor evangelizes the system, secures and sustains funding, navigates political issues, effects cultural change, and helps prioritize projects. Research shows a high correlation between the commitment of a business sponsor and success rates of BI solutions, which include performance dashboards (see Exhibit 4.1).

In fact, what is most interesting is that projects with a "very committed" sponsor are twice as likely to succeed as those with a "fairly committed" sponsor (67 percent versus 30 percent). And almost half (46 percent) of projects with "fairly committed" sponsors—the next level below—are actually struggling. So, sponsors cannot be half-hearted or even three-quarters hearted; they must give it 100 percent if they want a successful project.

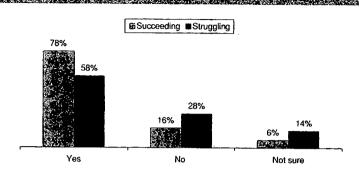
The sponsor must also assign a trusted lieutenant to guide the project on a daily basis. These "drivers" or "champions" need to devote at least 50 percent of their time to the project. Like the sponsor, they must be well respected and con-



Projects with "very committed" sponsors are more than twice as likely to succeed, whereas projects with "fairly committed" sponsors are more likely to struggle.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).

EXHIBIT 4.2 DOES YOUR PROJECT HAVE A BUSINESS DRIVER?



Successful BI projects almost always have a business driver and are more likely to be succeeding than struggling.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).

nected in the organization, with a direct line to the executive suite. They need to lead interference for the project when it gets bogged down in politics, vendor negotiations, or budget planning. Often, the driver is the person who initiates the idea for the project and sells it to the sponsor, whose influence and credibility are vital to the success of the project.

Although the presence of a business driver does not correlate with success to the degree that having a committed sponsor does, nevertheless most successful projects have a business driver (see Exhibit 4.2).

3. A Clear and Urgent Need

This aspect is almost too elementary to mention, but it plays a pivotal role in whether a performance dashboard project succeeds or not: the sponsoring group must demonstrate a clear and urgent need for a performance management system. If not, the system will not take root. The best performance dashboards address a critical pain in the business that stems from a lack of information and alignment with strategy. Paradoxically, the more pain, the more likely a performance dashboard will flourish. Unless the business is starving for information and a way to monitor and manage business performance, the project will not survive the strong tides and currents that wash many technology projects out to sea.

There are many legitimate reasons to implement a performance dashboard. Perhaps the biggest is that an existing performance management system is ineffective. It tracks lagging measures and has not improved the company's profitability, revenues, or share price. Or perhaps employees hardly notice when the system is updated. Or maybe few managers conduct personal performance

reviews on a regular basis, which shows that the company's culture does not value performance measurement or individual accountability.

Other events that often drive organizations to implement a performance dashboard include the following:

- A New Top Executive. The company hires a new CEO, CFO, or CIO who is used to running an organization using business performance management techniques and performance dashboards.
- A New Strategy or Initiative. Executives need a way to educate the
 organization about a new strategy or strategic initiative, align everyone's
 actions to the objectives, and monitor progress toward achieving goals.
- A Merger or Acquisition. A company must align two incompatible sets
 of strategies, cultures, values, and goals and get everyone marching in the
 same direction quickly.
- A Business Crisis. There are many events that can put an organization into crisis mode, requiring laser-like focus for the company to survive the calamity: a new competitor or market-transforming technology, an economic downturn, a natural disaster, financial mismanagement, or criminal wrongdoing, and so on.
- Organizational Restructuring. Executives who reorganize groups and divisions to improve productivity or competitiveness need to explain their rationale and monitor the effectiveness of the move.
- Confusion over Data. Executives can become exasperated by the lack of
 consistent data, which prevents them from getting a clear picture of the
 organization at any given moment.
- Core Systems Overhaul. An organization that replaces multiple legacy systems with a packaged business application needs to monitor the progress of the project and measure the return on investment.
- New Regulations. New regulations, such as the Sarbanes-Oxley Act or the Basel Accord, may force organizations to change their strategy or revamp core processes.

Coaches frequently motivate players with the maxim "There is no gain without pain." However, with performance dashboards, it is better to say, "There is no project without pain." Find a group with strategic or informational pain, and you have found a good place to implement a performance dashboard.

4. The Support of Mid-Level Managers

Successful performance dashboards solutions need the support of mid-level managers to succeed. This group determines the success or failure of a performance dashboard more than any other. These managers translate strategic goals and

objectives into initiatives, metrics, and budgets to govern their areas. Their words and actions signal whether their staff should take executive edicts seriously or not. If they are unwilling partners—or worse, active saboteurs—the project cannot succeed. It is critical to win the support of mid-level managers because they know how the company operates on a day-to-day basis and can provide a healthy "reality check" to senior executives. Mid-level managers often know which metrics will work and which will not, what data are available to populate metrics, and to what level in the organization it makes sense to deploy scorecards.

"They generally know the best sources of information, the biggest issues, and the best workarounds. We also use these mid-level managers as advocates back into the organization, both up and down and across, to help communicate the program, benefits, and what people will be able to use," says Martin Summerhayes, program manager in Hewlett Packard TSG. Unfortunately, mid-level managers can also be the ones most threatened by a performance dashboard. They are used to massaging and spinning numbers to present themselves and their group in the best possible light to executives higher up in the organization. A performance dashboard undercuts their ability to do this, leaving them feeling exposed and vulnerable. A performance dashboard broadcasts their performance to everyone through an unfiltered lens. They may feel they have to scramble and compete for budget dollars, resources, and promotions like never before and aren't happy about it.

It takes considerable effort and political savvy to win the hearts and minds of mid-level managers. Executives have to educate these managers about how the program benefits them personally as well as their group, and they have to quell unfounded fears. Executives identify key individuals who can make or break a project and communicate with them early and often. If appropriate, executives should invite the most pivotal managers to sit on the steering committee that oversees the project. The managers may see this as an honor and view the project more favorably as a result; at the very least, it gives executives a good way to keep an eye on key managers and make sure they have a positive attitude toward the project.

5. The Appropriate Scale and Scope

Most people assume a performance dashboard is always implemented on an enterprise scale starting with the executive suite, but this is not always true. Sometimes, it is better to implement a performance dashboard in a business unit, region, or department that is highly receptive to it. If the initial project succeeds, it will spread quickly throughout the organization. However, if executives try to force-fit a performance management system into an organization or business unit that is not ready for it, the tool will not gain the momentum it needs to expand throughout the enterprise.

When deploying a strategic dashboard (i.e., Balanced Scorecard) in a business unit or group, Niven recommends selecting a unit that conducts business across

an entire value chain of activities. In other words, the business unit should have a "strategy, defined customers, specific processes, operations, and administration." Selecting a unit with a narrow, functional focus will produce a strategic dashboard with narrow, functionally focused metrics that will not be readily transferable elsewhere in the organization.

6. A Strong Team and Available Resources

To succeed, an organization needs business and technical people with the right skills who are willing and available to work on the project.

On the business side, the sponsor and driver must allocate enough time and attention to nurture the project through its entire life cycle. They also must stick around for the duration of the project or garner sufficient consensus and momentum so the project can continue without them. Successful projects have business people who are skilled at selling, funding, prioritizing, and completing projects as well as communicating requirements, managing risk, and accepting responsibility for the outcomes (see Exhibit 4.3).

On the technical side, successful projects have technical teams with strong technical and project management skills. Successful technical teams score especially well on the "soft issues," such as the ability to communicate technical issues

Ability to sell and justify the project

Willingness to take responsibility for the outcome

Willingness to guide and oversee the project

Ability to prioritize BI projects

Willingness to fund infrastructure for the long term

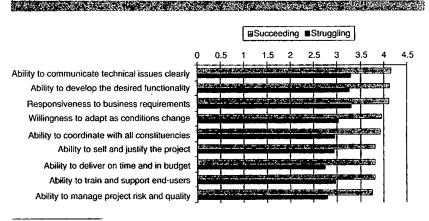
Ability to manage (isk and tackle internal politics

Ability to specify success metrics for the project

Business teams that can sell, manage, and develop the project further are more likely to deliver successful solutions. (Chart based on a 5-point rating scale, with 1 being "poor" and 5 being "excellent.")

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).

EXHIBIT 4.4 TECHNICAL TEAM CAPABILITIES



Technical teams that work well with the business and exhibit strong technical skills are more likely to deliver successful solutions. (Chart based on a 5-point rating scale, with 1 being "poor" and 5 being "excellent.")

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (*TDWI Report Series*, 2003).

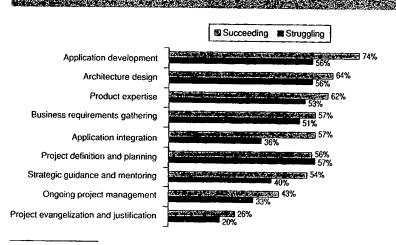
clearly, respond to business requirements, and develop desired functionality (see Exhibit 4.4).

If the needed resources do not exist in-house, the organization must be willing to bring in outside consultants and contractors. However, they need to put in place a plan to transfer consultants' knowledge and skills to in-house workers so the company is not dependent on the consultants. Organizations with successful solutions rely heavily on management consultants to help formulate strategy and metrics, develop project plans, and implement change management programs; they use technical consultants largely to assist with application development, architectural design, product installation, requirements gathering, and application integration (see Exhibit 4.5).

7. A Culture of Measurement

Does the business already have a culture of managing through performance measures? If not, even the strongest desire may not be enough to overcome organizational inertia. At a bare minimum, does it compare performance with plan or forecasts? Does it hold individuals and groups accountable for performance? Does it conduct individual performance reviews using objective data?



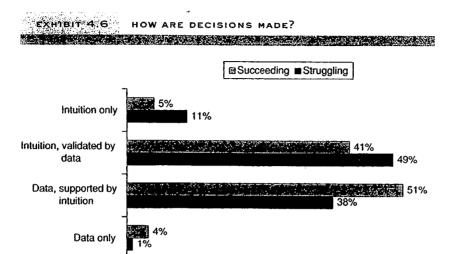


Companies with successful BI solutions rely on consultants more than companies with struggling BI solutions in all areas, but especially application development, application integration, and strategic guidance and monitoring.

Similarly, the organization should have a history of using information and data to make decisions. If the organization relies primarily on intuition, it will struggle to succeed (see Exhibit 4.6).

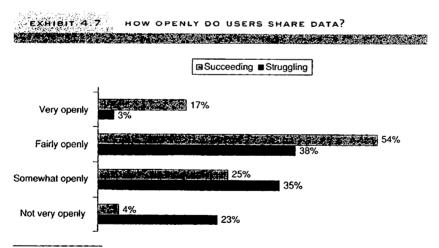
"Our company used to make decisions on gut feel," says a director of business information and analysis at a major U.S. manufacturer, "but now our executives believe strongly that fact-based decision making gives us a competitive advantage. Executives now ask 'Where are the data to back up this decision?' and they expect sales people to use information to close deals, not just rely on the strength of their client relationships. And it's working!"

Performance dashboards work best in a corporate culture that encourages users to share information. They cannot flourish if executives tightly control information to insulate themselves from the rest of the company; or if managers use information as a political weapon to protect their turf; or if users are penalized for sharing information with colleagues. In contrast, organizations whose employees share information "very openly" are five times more likely to have a successful solution than those whose employees do not (17 percent to 3 percent). Organizations whose employees do not share information openly are five times more likely to struggle (23 percent to 4 percent) (see Exhibit 4.7).



Organizations that rely on data to validate intuition and make decisions are more likely to succeed.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).



Organizations in which users share data openly are more likely to succeed with BI projects, such as performance dashboards.

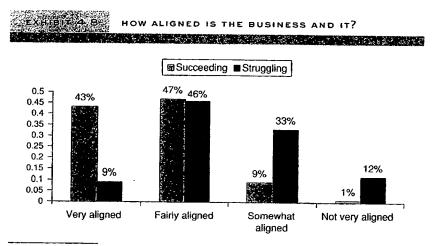
Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (*TDWI Report Series*, 2003).

8. Alignment between Business and IT

The degree of alignment between the business and the technical team also determines the readiness of an organization to adopt a performance dashboard. That is because performance dashboards are adaptive systems that continually change as the business changes. Performance dashboards require a great deal of ongoing interaction between the business user and the technical team to define new requirements, metrics, and targets and refine old ones. If the relationship between business and technical groups is tense and both groups eye one another with distrust and sarcasm, then the chances that a performance dashboard will succeed are minimal. We will discuss business-IT relationships in detail in Chapter 14.

Like sponsorship, there is no middle ground with alignment. Teams that are "very aligned" are almost five times more likely to succeed, whereas teams that are only "fairly aligned" struggle a whopping 46 percent of the time. The key to guaranteeing success is to achieve total alignment between the business and technical sides of the team (see Exhibit 4.8).

So what does a "very aligned" team look like? First of all, it has an actively involved business sponsor or driver. Second, it is a team—not two or more disparate groups with different leaders, objectives, and cultures. "We sit side by side with business people and report into the same leadership," says a senior technology manager who helps run the BI team at a telecommunications firm. "The only difference is that we specialize in the data and they specialize in the business processes."



When business and technical teams are "very" aligned, a project is almost five times more likely to succeed than fail. Teams that are only "fairly" aligned are as likely to fail as succeed.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).

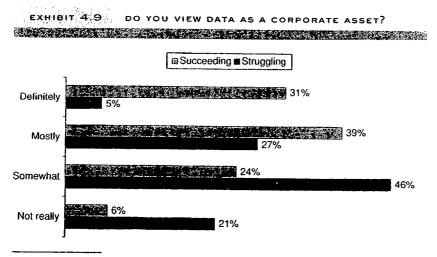
9. Trustworthy and Available Data

Does the organization have the right data to populate metrics in a performance dashboard? Although it is unlikely that data exist for all measures, a new initiative should supply data for most of the metrics under consideration. It is also critical that someone evaluate the condition of the data. Nothing can damage the credibility of a project faster than launching a performance dashboard with inaccurate and untrustworthy data.

Because data are at the heart of most performance management systems, organizations need to treat data as a vital corporate asset, as important as other assets, such as buildings, people, and cash. Companies whose executives view data as a corporate asset are six times more likely to be successful than those whose executives do not (31 percent versus 5 percent). Companies with executives who do not view data as an asset are between two and three times more likely to struggle with BI projects (see Exhibit 4.9).

10. A Solid Technical Infrastructure

To generate data for performance dashboard metrics, companies often must either overhaul operational systems and processes or establish a BI infrastructure



Companies that perceive data as a corporate asset are more likely to succeed with BI projects like performance dashboards.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (*TDWI Report Series*, 2003).

that delivers high-quality data, or both. However, not all performance dashboards require a robust technical infrastructure to initiate a project. Strategic dashboards, in particular, can often start by using manual processes to capture and disseminate key data elements (see Spotlight 4.2).

SPOTLIGHT 4.2 GROWING INTO A BI INFRASTRUCTURE

Balanced Scorecard consultants argue that organizations should not delay a strategic dashboard project because they lack the requisite data or a robust BI infrastructure. Bill Barberg, president of insightformation, inc., describes a hypothetical scenario:

Suppose that the executives at a mid-sized manufacturing company that recently acquired several plants, each with its own IT systems, create a strategy to become a low-cost producer. One "causal driver" in this strategy involves driving scrap and rework to levels significantly below the industry average. Unfortunately, the company does not have good data to measure scrap and rework processes, and the data that exist are spread across many operational systems with different database fields and definitions: Few of the systems track why things are scrapped and do not reflect labor costs associated with the process. In addition, there are no industry benchmarks against which they can compare their performance.

The executives quickly realize that it might take several years to overhaul the company's operational systems and processes to capture the information they need and then create a BI solution to analyze, aggregate, and accurately track detailed scrap and rework information across the company. Rather than delay the Balanced Scorecard project until they have a solid technical foundation, the executives decide to forge ahead, and make do with less than perfect information.

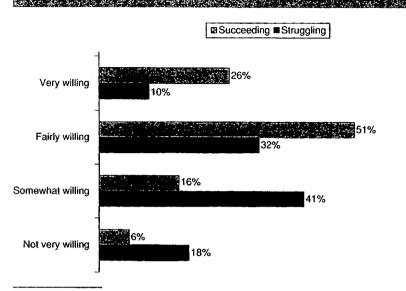
Barberg says the executives made the right choice. Even a set of rough monthly measures for scrap calculated by hand provides direction and, more importantly, communicates a powerful message about what the company needs to focus on to succeed. The scorecard motivates managers and staff to take positive steps to reduce scrap, and these behaviors can be reinforced through additional objectives and monthly scorecard review meetings.

To track progress against its strategic objectives regarding scrap, executives can assign a business analyst to create a spreadsheet report that merges and standardizes data collected by hand at each plant with relevant operational data. At the very least, the analyst can summarize monthly results in the Balanced Scorecard and attach the report. However, if the scorecard software has simple aggregation or roll-up capabilities, it can also show trends for each plant.

Meanwhile, with a clear understanding of the type of information that is needed, the company can work on a parallel track to upgrade its operational systems to capture data required for the Balanced Scorecard and implement an activity-based costing system to allocate labor cost to scrap. The company can also implement reporting and analysis tools that deliver a standardized view of scorecard metrics, Barberg says.

Although the company would have benefited from having integrated operational systems and a robust BI infrastructure to start, it can reap some benefits without them. Eventually, it can upgrade its technical infrastructure to further increase the value the project delivers, says Barberg.

EXHIBIT 4:10. WILLINGNESS TO FUND INFRASTRUCTURE



Organizations that are "very willing" or "fairly willing" to fund a BI infrastructure are more likely to succeed with BI projects than those that don't.

Source: Wayne Eckerson, "Smart Companies in the 21st Century: The Secrets of Creating Successful Business Intelligence Solutions" (TDWI Report Series, 2003).

The BI infrastructure consists of the BI environment (data warehouses, data marts, and analytical tools), the technical platform (servers, storage, networks), and the people to feed and maintain the environment. Organizations that are very willing or fairly willing to fund a BI infrastructure are more likely to succeed than those that are not. We will discuss what a robust BI infrastructure looks like and how to get there in the next chapter (see Exhibit 4.10).

Readiness Worksheet

Using the above criteria, organizations can assess their readiness to implement a performance dashboard as a whole or identify the best business unit or group to start with. Exhibit 4.11 adapts Niven's readiness assessment tool to an evaluation of a performance dashboard project within a business unit of a larger company.

To use the tool, assign a percentage weight to each criterion based on its importance to your organization. The weights should add up 100 percent. Then, score the organization (or a group within it) on its ability to support each crite-



EXHIBIT 4 [] BUSINESS UNIT READINESS ASSESSMENT

		CONTRACTOR DE LA CASACIONA		
Criteria	Score	Weight	Total Points	Rationale
Strategy	10	15%	1.5	This unit has recently completed a new strategic plan for the next five years.
Sponsorship	9	15%	1.35	The new unit president used a strategic dashboard at two other organizations.
Clear need	5	10%	0.5	This group has performed well and may not see the need for this tool to sustain future efforts.
Midmanager support	7	5% ·	0.35	Young, energetic management group willing to experiment with new approaches.
Appropriate scope	8	5%	0.4	This unit produces, markets, and sells a distinct set of products.
A strong team	4	5%	0.2	The unit has talented staff who are already overextended so the unit will have difficulty finding resources for this project.
Culture of measurement	7	15%	1.05	Despite the unit's success, it has not used performance measurement systems in the past.
Business–IT alignment	5	15%	0.75	The unit has its own IT team, but it has lost staff since corporate IT declared its intentions to subsume the group.
Trustworthy and available data	4	5%	0.2	Many customer metrics (i.e., loyalty) have no data source, and customer data are spread across many systems.
Solid BI infrastructure	5	10%	0.5	The unit primarily runs on spreadsheets maintained by many people, although it wants to purchase a BI tool.
TOTAL	64	100%	7.3	

Overall Assessment: This unit scores a very high 7.3 out of 10 and is a good candidate for the performance management system but poses a few potential risks. The data, resource, and alignment issues, while not insignificant, are mitigated by the strong leadership of the unit president, and the creation of a new strategic plan. Early education initiatives within this unit could focus on the value of the system as a means of sustaining results for the long term. This may reduce skepticism surrounding the implementation based on the past success of the unit.

Source: Adapted from Paul R. Niven, Balanced Scorecard Step By Step: Maximizing Performance and Maintaining Results (John Wiley & Sons, Inc.), 2002, page 46.

rion, using a value from one to ten. Then, for each criterion, multiply the score by the weight to obtain points. Add up all the points for each criterion to get a total score. Because the maximum number of points that can be scored is ten, an organization (or group) that scores between seven and ten points is a good candidate for a performance dashboard. An organization (or group) that scores between four and six points poses significant risk, and a group that scores below four points should not attempt the project (see Exhibit 4.11).

Evaluating a business unit or department against the ten criteria above provides a great way to assess the readiness of an organization to implement a performance dashboard.

SUMMARY

Not all companies are ready to implement a performance dashboard. Organizations need strong leadership, a receptive culture, and a robust technical environment.

You can assess your organization's readiness to implement a performance dashboard by asking the following questions:

- Does your organization have a clear, coherent strategy with well-defined goals, objectives, and measures?
- Is there a high-level executive who strongly believes in the project and is willing to spend time evangelizing and nurturing the project?
- Does the organization have a demonstrated need for the system? How much is it suffering from an inability to track and measure performance?
- How willing are mid-level managers to support the project? Will the open sharing of performance results threaten their positions and their hold on power?
- Does the group have sufficient scope so that the implementation can be adapted by other groups in the organization?
- Does the group have business and technical people with proper skills and experience to deliver a successful project?
- Does the group already have a culture of measurement and make decisions by fact instead of intuition?
- How aligned are the business and technical teams? Do they have a good working relationship and trust one another?
- Do data exist to populate the measures? How clean, valid, and complete are the data?
- Does the group have a solid technical infrastructure that generates the required data and delivers it to users in a format that is easy to monitor and analyze?

These ten questions can help executives determine the best place to implement a performance dashboard as well as understand better the risks the project poses and the obstacles they will need to overcome.

NOTE

1. James C. Collins and Jerry I. Porras, "Building Your Company's Vision," Harvard Business Review, September-October 65-77 (1996), as referenced in Paul Niven, Balanced Scorecard Step by Step: Maximizing Performance and Maintaining Results (Hoboken, NJ: John Wiley & Sons, Inc., 2002), p. 74.



Assessing Your Technical Readiness

BUSINESS INTELLIGENCE MATURITY MODEL

The Big Picture

In the previous chapter, we discussed ten criteria for evaluating the readiness of an organization to implement a performance dashboard. This chapter focuses more specifically on evaluating an organization's technical readiness. Without a strong technical foundation—especially in business intelligence (BI)—most performance dashboards will not survive long. They will be crushed by the weight of cumbersome and costly data-gathering processes, inaccurate and untrust-worthy data, poor performance, and antiquated functionality.

Like organizational readiness, technical readiness does not happen overnight. It takes years to build a robust BI infrastructure and develop the internal skills and talent necessary to support an effective performance management system. During the past several years, many organizations that initiated performance dashboards became disillusioned when they could not automate the solution or populate its metrics with valid, accurate data.

I've created a BI Maturity Model to help organizations understand the maturity of their BI infrastructures and, by extension, their readiness to build and sustain a performance management system. The six-stage BI Maturity Model shows the trajectory that most organizations follow when evolving their BI environments from low-value, cost-center operations to high-value, strategic utilities that drive market share. The model provides organizations with a

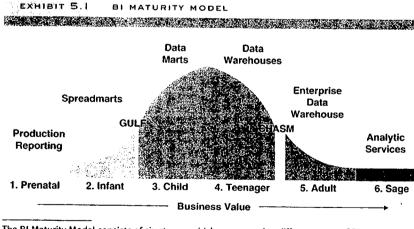
"big picture" view of where their BI environment is today, where it needs to go, and how to get it there.

The model shows that performance dashboards are best deployed once organizations reach Stage 4 or later. At this level of maturity, organizations can quickly deploy performance dashboards without having to make significant investments to create or rearchitect a BI environment. In Stage 5, organizations are ready to cascade strategic dashboards throughout the enterprise and link them (logically at least) to operational and tactical dashboards. In short, it takes a reasonable amount of BI maturity for organizations to deploy a performance dashboard successfully.

Six Stages

Exhibit 5.1 shows that the BI Maturity Model consists of six stages: Prenatal, Infant, Child, Teenager, Adult, and Sage. As an organization moves through successive stages, business value increases as data become more consolidated and logically integrated within fewer analytic structures.

The BI Maturity Model is shaped in a bell curve to indicate that most organizations today have reached Stages 3 and 4. Only a few are still stuck in the first two stages or have advanced to highly mature implementations in Stages 5 and 6. Because business intelligence originated as a distinct discipline in the early 1990s, it is no surprise that after a decade or so most organizations have reached "BI adolescence" and are suffering all the requisite growing pains (see Spotlight 5.1).



SPOTLIGHT 5.1 SYMPTOMS OF BI ADOLESCENCE

Most organizations today are in the adolescent phase of business intelligence. If you remember correctly from your youth, adolescence is both an exciting and a painful time, full of change, transition, and surprises. The same is true for companies that reach adolescence in business intelligence. Every step forward is tentative, and more setbacks are experienced than victories. The key to getting through this stressful period is to stay focused on the future and the value that awaits those who persevere while taking one step at a time in the present. Here are a few symptoms that signify that your organization is square in the middle of BI adolescence.

- . The Bt team moves perpetually from one crisis to the next.
- The BI program manager has to explain continually why the BI budget should not be cut.
- Usage of the BI environment peaked several months after deployment and continues to decline.
- The Bimanager has to evangelize continuously the value of the BI environment to executives and business users.
- The number of spreadmarts, independent data marts, and other data warehouses with redundant data keeps increasing instead of decreasing.
- Users keep asking the IT department to create custom reports even though the organization recently purchased a "self-service" BI tool.
- Executives still believe BI is a tool, not a strategic information resource to drive the organization in the right direction.

Managing a BI environment in its adolescence is painful. Perhaps the only comforting thought is that most companies are also experiencing the same growing pains. Like your organization, they spend more time reacting to problems than proactively solving them and put more effort into putting out fires than delivering lasting business value. In short, most organizations are stuck in the Chasm, halfway between adolescence and adulthood.

The BI Maturity Model defines each stage using a number of characteristics, such as scope, analytic structure, executive perceptions, types of analytics, stewardship, funding, technology platform, change management, and administration (for which we borrow concepts from the Software Engineering Institute's Capability Maturity Model). This book will focus only on a few of these characteristics.

Organizations evolve at different rates through these six stages and may exhibit characteristics of multiple stages at a given time. Thus organizations should not expect to move cleanly and precisely from one stage to the next.

Although it is possible to skip stages, it is unlikely. Organizations must learn critical lessons at each stage before they can move to the next. Organizations that feel compelled to "catch up" and skip stages will encounter problems that

eventually bog down the project. Organizations that successfully skip stages must have strong senior leadership, considerable funding, and experts with considerable BI experience to guide the project to a successful completion.

More likely, an organization will regress and slip backward in the evolutionary cycle. Often, the cause is beyond the project team's control: a merger, acquisition, new executive leadership, changing economic or competitive circumstances, or new regulations. Here, the plans are put aside to address the new issues. This makes many BI professionals feel like "Sisyphus," the ancient Greek condemned to roll a huge stone perpetually up a hill in Hades only to have it roll down again upon nearing the top.

Sticking Points

Although a few companies skip stages, and more regress, almost every organization gets stuck at two points in the life cycle. These are represented in the model as the "Gulf" and the "Chasm." Most BI initiatives stall here. They have one foot stuck in the previous stage while the other is reaching out to the next, and they are unable to make a clean leap beyond. As a result, many never fully reach the other side and reap the benefits therein.

The Gulf

The primary way to cross the Gulf is to change executive perceptions. Executives must recognize that they need more than a production reporting system to make timely, effective decisions and that the dozens of spreadsheets and desktop databases (i.e., spreadmarts) that run the business undermine productivity and effectiveness. Once they recognize this, they need to mandate and fund a BI initiative to move the organization off the old systems and onto the new ones that empower users to access, analyze, and act on information.

The Chasm

The Chasm is deeper and wider than the Gulf and harder to cross. There are several reasons:

- Perceptions. Executives fail to transform their view of BI from a tool for power users to an enterprise resource for all users and that is critical to the mission of the company.
- Ownership. Divisional or departmental managers resist turning over their successful BI initiatives, including performance dashboards, to a corporate group so the systems can be scaled up and out and disseminated to the rest of the organization.



- Self-Service. Organizations fail to shift their emphasis from building data warehouses to empowering users with BI tools, such as performance dash-boards, that foster self-service access to information.
- Mental Silos. The organization fails to break down end-users' mental silos for accessing information in a BI environment and show them how to perform cross-departmental analyses that lead to deep insights about how to optimize performance.

The following is a brief description of each stage and its major characteristics.

Prenatal Stage: Production Reporting

Most established organizations have production reporting systems generating standard reports that are usually printed and distributed to large numbers of employees on a regular basis, usually weekly, monthly, or quarterly. Because programmers hand-code the reports, it can take several days or weeks to produce a new or custom report. This creates a backlog of requests that the IT department can never get ahead of, as well as many frustrated users who cannot obtain timely information to do their jobs.

Consequently, many users take matters into their own hands, especially business analysts who know their way around corporate information systems and whose job is to crunch numbers on behalf of executives and managers. These individuals circumvent the IT department by extracting data directly from source systems and loading the information into spreadsheets or desktop databases. This gives rise to an abundance of spreadmarts, which is the hallmark of Stage 2.

Infant Stage: Spreadmarts

Spreadmarts are spreadsheets or desktop databases that function like data marts. Each spreadmart contains a unique set of data, metrics, and rules that do not align with other analytical systems in the organization. An organization afflicted with spreadmarts has no consistent view of the business and no single version of truth from which every employee can work.

Spreadmarts ultimately wreak havoc on organizations. They bleed organizations dry, often without the organizations knowing it. Users spend inordinate amounts of time collecting and integrating data, becoming, in effect, "human data warehouses." Executive meetings dissolve into chaos as managers argue about whose data are right rather than making effective decisions. This phenomenon is known as "dueling spreadmarts."

Spreadmarts are difficult to eradicate—because they are ubiquitous, cheap, and easy to use. Many users, especially business analysts and financial managers, cannot function without spreadsheets. Spreadsheets give them a high degree of local control at extremely low cost, which undermines departmental, divisional, or enterprise standards. As a result, spreadmarts proliferate like weeds—organizations have dozens, if not hundreds or thousands of these pernicious analytical structures.

Research shows that organizations on average have 28.5 spreadmarts. However, the reality is that most organizations have no idea how many spreadmarts they have, and many have given up trying to control their proliferation. Although spreadmarts are difficult to eradicate, there are remedies for curing this "disease" before it poisons the entire organization (see Spotlight 5.2).

Spotlight 5.2 Strategies for Eradicating Spreadmarts

Spreadmarts are renegade spreadsheets and desktop databases that contain vital pieces of corporate data needed to run the business. However, because they are created by individuals at different times using different data sources and rules for defining metrics; they create a fractured view of the enterprise. Without centrally defined metrics and a single version of corporate information, organizations cannot compete effectively.

Today, spreadmarts are the bane of workers in IT departments, who cannot control their proliferation, and the nemesis of CEOs, who cannot gain an accurate view of the enterprise because of them. Flere are five strategies—the five "Cs"—for gradicating spreadmarts:

- 1. Coercion: Have the CEO mandate the proper use of spreadsheets and desktop databases. By itself, this strategy rarely works because it is difficult to enforce in fact; coercion usually makes the problem worse. Users go underground, managing their divisions and departments with clandestine spreadmarts that run parallel to "official" systems. The old adage, "What you resist, persists" applies to spreadmarts. However, without a strong executive mandate, users are often refuctant to change their analytical habits. So, it's best to use this tactic in conjunction with one or more of the approaches below.
- 2. Conversion. This strategy involves selling the benefits of the organization's standard BI environment. The key is to make sure the BI environment provides at least 150 percent the value of spreadmarts (which is sometimes difficult!). The key selling points are:
 - Saves Time. The BI tool collects and integrates the data (via a data warehouse) so you no longer have to perform these functions
 - Improves Data Quality. The BI tool provides cleaner and more accurate data than any spreadmart (thanks to the data warehouse).



SPOTLIGHT 5.2 (CONTINUED)

- Provides Deeper Insights. The BI tool lets you analyze data across more systems and subject areas, leading to deeper, career-enhancing insights.
- Offers Comparable Functionality. The BI tool provides the same analytical functions and features as the spreadmart, such as briefing books, charting, report manipulation, "what-if" modeling, and offline usage.
- Offers Additional Functionality. The BI tool supports additional functions, such as the ability to schedule, share, or annotate reports, collaborate with colleagues, and easily publish reports to a portal.
- Offers Support. The BI tool and data warehouse are supported by the IT department so you do not have to worry when something breaks.
- 3. Co-existence. This strategy turns Excel into a full-fledged client to a BI server. Rather than force users to switch tools, let them use Excel to access data and reports on the BI server. This gives them all the spreadsheet features they know and love and lets the organization manage critical data and reports in the standard way. This is perhaps the best option when used in conjunction with number two above. Ironically, this option will expand the use of Excel for BI while minimizing or eliminating the use of Excel as a spreadmart.

There are two ways to make Excel a BI client. In a tightly controlled environment, Excel users access predefined reports that are rendered in Excel on the server. In a more open environment, Excel users query back end systems using a semantic layer—a set of predefined query objects defined by the IT department that govern access to data in source systems. Most leading BI vendors now support both methods of integrating with Excel:

- 4. Co-option. The fourth strategy takes the approach: "If you can't beat them, join them?" This strategy automates spreadmarts by running them on a central server maintained and managed by IT. IT does not change the data access methods: processes, or rules set up by spreadmart users, it just maintains them on their behalf, freeing up users to spend more time analyzing data and less time collecting and massaging it. Gradually, over time, the IT department can transfer the spreadmarts to a more standard environment. Several BI vendors, such as Compassoft and Meta5, now offer co-option tools.
- 5. Cower. The last strategy is a variation of the first. Sarbanes-Oxley regulations in the United States provide the IT department with a huge stick to enforce data management standards across the organization. Because most top executives would prefer to stay out of jail, it often does not take much to convince them to support an enterprise architecture that standardizes the use of tools and data to deliver key financial reports, among other things.

Whatever strategy you use to deliver a single version of the truth, the key is to be patient. Analytical habits do not change overnight. With a heavy dose of patience, strong communications skills, and a robust BI environment, you should be able to control the proliferation of spreadmarts.

EXHIBIT 5.2 CROSSING THE GULF: THE SPREADMART DILEMMA

	Prenatal	Infant	Child	Teenager	Adult	Sage
Scope	System	Individual	Department	Division	Enterprise	Inter-Enterprise
Funding	п	H.R.	Dept. Budget	Div. Budget	IT/Bus.	Self-funding
Team	17	Analyst	Dept. IT	Div. IT	Corp. IT	BI Business Unit
Governance	ΙΤ	CEO	Bt Project Mgr	8l Program Mgr	Bl Stewardship	Bi Unit Execs
Flexibility/ Standards	\langle	Local control Think Local, Resist Global S Enterprise Standards		Negotiate &	Team Plan Plan Acti	Slobal Z coal Z
Architecture	Mgmt Reporting	Spreadmarts	Data Marts	Data Warehouses	Enterprise DW	Analytical Services

Like invasive weeds, spreadmarts are difficult to eradicate. They provide a high degree of local control at low cost, which undermines departmental, divisional, or enterprise standards. This is why many organizations have a difficult time crossing the gulf and reaping the full benefits of the Child and Teenager stages. Enterprise standards start to gain the upper hand (as they should) in the Teenager stage and then grow in parallel with local control in the final two stages, as the BI environment becomes extremely flexible and responsive to new and changing user requirements.

Although organizations afflicted with spreadmarts may build data marts and data warehouses and appear to enter Stages Three and Four, they do not get very far. Spreadmarts sap the vitality of those structures and prevent organizations from reaping their benefits. To cross the Gulf from the Infant to Child stage, spreadmart users must sacrifice their autonomy and individual views of the business and adopt departmental or divisional standards for design, delivery, and definition of data and information. Most users do not relinquish local control and their spreadmarts without a fight, which is why the Gulf is so difficult to cross! (See Exhibit 5.2.)

Child Stage: Data Marts

In the Child stage, departments recognize the need to empower all knowledge workers with timely information and insight, not just business analysts and executives, who are the primary beneficiaries of spreadmarts. Departmental leaders fund the development of data marts, assign project managers to oversee the initiatives, and purchase BI tools so users can access and analyze data in the marts.

A data mart is a shared, analytic structure that generally supports a single business process or department, such as sales, marketing, or finance. The departmen-

tal team gathers information requirements and tailors the data mart to meet the needs of the members in its group. A data mart requires members of a department to consolidate or replace multiple spreadmarts and negotiate data definitions and rules to ensure data consistency throughout the department.

Unfortunately, data marts often fall prey to the same problems that afflict spreadmarts. Each data mart supports unique definitions and rules and extracts data directly from source systems. Although these so-called "independent" data marts do a great job of supporting local needs, their data cannot be aggregated to support cross-departmental analysis. What is needed is a mechanism to integrate data marts without jeopardizing local autonomy. This is the hallmark of the Teenager stage.

Also, most companies purchase more BI licenses than they need. They do not realize that many BI tools are geared to "power" users who are technically literate and conversant with the company's databases and access methods. These power users comprise less than 20 percent of all knowledge workers. Thus, the payoff from BI in this stage is low, with minimal to nonexistent return on investment (ROI) although the company may reap significant intangible benefits (see Exhibit 5.3).

THE ROI OF BUSINESS INTELLIGENCE "似乎"。"在这个位于400年至3年20年6年20年7月20日,1980年20日 Prenatal Infant Child Teenager Adult Sage Type of System Executive Analytical Monitoring Strategic Financial Business System System System System System Service Analytics Paper **Briefing Book** Interactive Cascading Dashboards Embedded Bl Report Report Scorecards Executive Perception Cost ROI Value Data Enterprise Analytical Architecture Mgmt Spreadmart Data Marts Warehouses DW Services Reporting

The ROI of business intelligence starts to increase dramatically in the Teenager stage as the organization provides users with timely, consistent data delivered in an intuitive fashion using all types of performance dashboards. ROI further escalates in the final two stages as the organization uses the BI environment to rapidly create large numbers of highly valuable analytical applications and insights that drive the business and the market.

Teenager Stage: Data Warehouses

The Teenager Stage begins when a business unit executive recognizes that the proliferation of non-integrated data marts is costing the group considerable sums of money and undermining a single view of operations. The executive calls a halt to the creation of new data marts and consolidates existing marts onto a single data warehousing platform. This consolidation usually happens in concert with something else, such as a strategic initiative to improve customer loyalty or an acquisition, merger, or reorganization.

Value Chain Analysis

Unlike single-subject data marts, a data warehouse encourages deeper levels of analysis. This is because users can now submit queries across functional boundaries, such as finance and operations, and gain new insights not possible when data were confined to departmental subjects. Unfortunately, most users fail to recognize the value of information in the data warehouse and never move beyond their mental silos to conduct cross-departmental analyses and discover highly profitable correlations in the data. BI managers must spend a great deal of time educating users about the full potential the data warehouse offers.

Performance Dashboards

This stage also empowers "casual" users with self-service BI tools, namely operational and tactical dashboards, that enable them to monitor and manage business processes quickly and easily. The performance dashboards provide actionable information to large numbers of individuals with minimal maintenance and administration. Executives value the performance dashboards as a way to improve process efficiency, empower users, and foster fact-based decision making.

Unfortunately, many organizations never advance further than here. They fall headfirst into the Chasm. They do not capitalize on their momentum. They fail to consolidate analytical silos throughout the enterprise, show users the benefit of cross-departmental analyses, or deliver self-service BI tools. Executives continue to view BI as a tactical tool instead of a strategic lever that drives the business and differentiates them from the competition. Departmental executives refuse to work cooperatively with corporate IT to expand successful solutions into enterprise resources.

It takes a lot of energy, vision, and willpower to cross the Chasm and enter into the final two stages of business intelligence.

Adult Stage: Enterprise Data Warehouse

Although a data warehouse delivers many new benefits, it does not solve the problem of analytical silos. Most organizations today have acquired multiple data warehouses through internal development, mergers, or acquisitions. Like spreadmarts and independent data marts, divisional data warehouses contain overlapping and inconsistent data, creating barriers to the free flow of information within and between business groups and the value chains they manage.

Integration Machine

In the Adult stage, organizations make a firm commitment to deliver a consistent view of the business. Executives view data as a corporate asset that is as valuable as people, equipment, and cash. They anoint one data warehousing environment as the system of record or build a new one from scratch to service the entire organization. This enterprise data warehouse (EDW) serves as an "integration machine" that the BI team uses to continuously consolidate all other reporting systems, data marts, and data warehouses unto itself. For example, some organizations use an EDW to assimilate acquired companies after a merger or acquisition.

An EDW does not have to be a single centralized data warehouse running on a single database management system. An EDW is a standardized BI environment that can be constructed in many different ways, ranging from a centralized or hub-and-spoke data warehouse to a set of conformed data marts or a federated environment glued together on the fly with EII and other tools and techniques (see Chapter 3 for more information on BI architectures).

In the Adult stage, the EDW serves as a strategic enterprise resource for integrating data and supporting mission-critical applications that drive the business. To manage this resource, executives establish a strong stewardship program. Executives assign business people to "own" critical data elements and appoint committees at all levels to guide the development and expansion of the EDW resource. On the analytical side, the organization starts to cascade strategic dashboards and integrate them with other performance dashboards in the organization. The cascading scorecards align every worker and business process to corporate strategy.

ROI

During the Adult phase, investments in business intelligence really begin to pay off. The ROI comes from delivering actionable information in a consistent fashion to large numbers of users who make better and more timely decisions that increase profits and revenues. The EDW also benefits from economies of scale and a fast-track development process that churns out new applications rapidly,

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meeting user requirements quickly and efficiently. In addition, users begin to perform profitable cross-departmental analyses and find new and unexpected uses for data in the EDW that developers had not anticipated, leading to a proliferation of profitable analytical applications. This "serendipity of scale" further accelerates ROI. Meanwhile, costs actually decline as the organization eliminates analytical silos and reduces overhead (see Exhibit 5.3).

Sage Stage: BI Services

Once business intelligence becomes a strategic enterprise resource that drives the business with an ever growing panoply of mission-critical applications, you may think the job is done. It may well be! However, there are additional opportunities to increase the strategic value of a BI environment by driving the resource outward and downward.

Interactive Extranets

Many companies today are already opening their data warehouses to customers and suppliers—extending and integrating value chains across organizational boundaries and driving new market opportunities. Next-generation extranet applications will provide customers and suppliers with simple, yet powerful interactive reporting tools to benchmark their activity and performance and compare them with those of other groups across a variety of dimensions. Some companies have already created new business units to sell data warehousing and information analysis services, creating a competitive advantage for themselves and altering the competitive landscape of their industries.

Web Services

At the same time, BI teams are encapsulating data and reporting and analysis functions into Web services that developers—both internal and external to the organization—can use (with proper authorization, of course) to build a raft of new analytical applications. The advent of Web services turns BI into a market-wide utility that can be embedded into any application. With BI services, workers will no longer have to shift contexts to analyze data. The data, information, and insights they need to do their jobs are embedded in the operational applications they use on a daily basis.

Decision Engines

These BI services also make it possible for companies to capitalize fully on their investments in statistical analysis and modeling. They turn statistical models into "decision engines" embedded in internal and external applications. Workers or applications feed information into these engines and receive recommendations instantaneously. For instance, a fraud detection system reviews your credit card transactions and compares them to a statistical model of your past purchasing behavior and spits out a score that indicates the degree to which a given purchase may be fraudulent. Other examples of decision engines are Web recommendation engines and automated loan approval applications (see Exhibit 5.4).

Once an organization enters the Sage stage, its value increases exponentially as its visibility and costs decline. As a Web service, BI becomes a utility that no one thinks about until it stops working. Our economy has commoditized innumerable services in the past: electricity, sewage, water, transportation, and so on. Insights delivered via BI are simply the next in line.

EXHIBIT 5.4 EVOLUTION OF REPORTING AND ANALYSIS

	Prenatal	Infant	Child	Teenager	Adult	Sage
BI Focus	What happened?	What will happen?	Why did it happen?	What is happening?	What should we do?	What can we offer?
BI Output	Information	Plans	Rules	Alerts	Action	Recommendations
Tools	Reports	Forecasts	OLAP	Dashboards	Cascading Scorecards	Statistical Models
	Decision Latency					
	Aware 2	ness } Junders	tanding	Actio Inform		Decision Z Automation
	Data Freshness					
		- Insights -	>	4	— Action —	-

The first three stages of business intelligence deliver "Insights" using historical data to analyze what happened, why it happened, and to build forecasts. The second three stages deliver "Action" using right-time data to populate performance dashboards and statistical models that automate decision making.

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SUMMARY

The BI Maturity Model described in this chapter is a good way to assess an organization's technical readiness to deploy a performance management system. The model shows that performance dashboards are best deployed once organizations reach Stage 4 or later. At this level of maturity, organizations can quickly deploy operational and tactical dashboards without having to make significant upfront investments. In Stage 5, organizations are ready to cascade strategic dashboards throughout the enterprise and link them (logically at least) to operational and tactical dashboards.

Many people who have heard presentations about the BI Maturity Model say it is "therapeutic." They find comfort in knowing that others have encountered the same growing pains they have. Many view the BI Maturity Model as a tool to help them envision the future and the steps needed to get there. They also view it as a perfect way to explain the potential of BI to their business counterparts as well as the investments and persistence required to deliver real value.



Performance Dashboards in Action



Types of Performance Dashboards

DIFFERENTIATING PERFORMANCE DASHBOARDS

Overview

Performance dashboards are becoming pervasive in organizations today. As we saw in Chapter 1, most organizations have already deployed a performance management system of some kind, and one-third use it as their primary analytical application. However, not all performance dashboards are created equal.

Chapter 1 described three types of performance dashboards:

- 1. Operational dashboards enable front-line workers and supervisors to track core operational processes.
- 2. Tactical dashboards help managers and analysts track and analyze departmental activities, processes, and projects.
- 3. Strategic dashboards let executives and staff chart their progress toward achieving strategic objectives.

Application Functionality

As mentioned above, each type of performance dashboard delivers three sets of related functionality—monitoring, analysis, and management—but in different degrees.

Operational dashboards emphasize monitoring functions more than analysis or management functions. Monitoring makes it easy for business users to track

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key metrics and receive alerts about out-of-bounds conditions. Tactical dash-boards emphasize analytical functionality more than monitoring or management features. Analytical functionality enables users to investigate the root causes of problems, issues, or trends. Strategic dashboards emphasize management features more than monitoring or analytical functionality. Management functionality enables executives to manage the execution of business strategy and foster collaboration among managers and staff and improve coordination among business units and departments.

Information Layers

Chapter 1 also showed that each type of performance dashboard contains three layers of information: graphical summarized views that make it easy for users to monitor exceptions; multidimensional views that let users "slice and dice" data; and transactional views that present users with detailed records and reports. However, the layers in each type of performance dashboard vary in thickness.

For example, operational dashboards tend to be "flatter" than both tactical and strategic dashboards because they report information at a transactional or lightly summarized level. There is not much room left to drill down in an operational dashboard. Tactical dashboards, on the other hand, provide the greatest analytical heft, giving users the ability to drill down from highly summarized to highly detailed information and across various dimensions and hierarchies in the data. While many strategic dashboards provide the same depth and breadth of information, some may only provide high-level strategic views based on a thin layer of highly summarized information, at least to start.

Dashboard Components

To understand the differences between the three types of performance dash-boards, it is necessary to examine the application components that each uses. Although there are no hard-and-fast rules about component usage, Exhibit 6.1 provides some general guidelines.

Operational Dashboard Components

Operational dashboards use a dashboard interface to monitor operational processes. The dashboards generate alerts that notify users about exception conditions in the processes they are monitoring so they can act quickly to fix a problem or exploit an opportunity. For instance, an alert might notify a dispatcher that a truck is leaving later than scheduled or with half its cargo space unfilled. Agents take alerts one step further by automating actions based on the nature of the

EXHIBIT 6. PERFORMANCE DASHBOARD COMPONENTS

	Operational Dashboard	Tactical Dashboard	Strategic Dashboard
Monitoring	Dashboard	BI Portal	Scorecard
Analysis	Statistical models Decision engines	OLAP analysis Interactive reporting Advanced visualization Scenario modeling	Time-series analysis Standard reports
Management	Alerts Agents	Workflow Usage monitoring Auditing	Meetings Annotations Strategy maps

The monitoring, analysis, and management components that most commonly comprise the three types of performance dashboards.

alerts. For instance, an automated agent that detects low sales in the Midwest region last period might query a database to find the contact information for the regional sales manager and send the information via pager to the manager of North American sales.

In general, operational dashboards display information about business events soon after they occur. However, sometimes even real-time information arrives too late for workers to do anything to rectify or improve a situation. For instance, an alert indicating that a truck just left the warehouse half-full does not allow the dispatcher or shipping dock worker to figure out a way to load the truck with additional cargo before it leaves.

Consequently, many operational dashboards apply statistical models to forecast or predict future states. For example, airlines dynamically modify prices for airlines seats by applying yield optimization routines to current bookings. Fraud detection dashboards use decision engines built on predictive models that automatically identify fraudulent transactions and trigger a workflow to validate the results, close the account, and contact the customer.

Tactical Dashboard Components

Tactical dashboards often display results in a business intelligence (BI) portal that contains charts and tables as well as other documents users need in order to mon-

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itor a project or process that they manage. These portals are built into most BI tools and usually integrate with commercial portals that many companies use to run their corporate intranets.

Tactical dashboards encourage users to explore information to identify trends and ascertain the root causes of problems or issues. This exploration is done using OLAP (i.e., multidimensional analysis) tools, parameterized reports, query tools, and advanced visualization tools, among other things.

Tactical dashboards also contain modeling tools that let users create plans that contain multiple scenarios. For instance, a pricing scenario might define a rule or hypothesis that says "If we increase prices by X percent, it will cause revenues to decrease by Y percent and profits to stay even." Most business people use Excel to create these scenarios or plans. However, most BI vendors now provide tight integration with Excel to corral such analysis within a centrally managed environment.

Because decisions are not made in a vacuum, tactical dashboards use workflow tools (i.e., primarily e-mail at this point) to allow users to share their findings with colleagues and request approval or action before going further. Usage monitoring and auditing tools help project sponsors and administrators to track user adoption and to audit who creates and edits key financial and performance reports.

Strategic Dashboard Components

Strategic dashboards use a scorecard interface to track performance against strategic objectives. Although they are similar to dashboard interfaces, scorecards generally track progress of groups on a monthly basis rather than a right-time basis. Also, scorecards generally display more metrics across a broader spectrum of the organization than dashboards, especially in corporate scorecards. Performance information in a scorecard interface is usually more summarized than in a dashboard interface.

In the analysis layer, strategic dashboards tend to display data using time-series charts and tables that plot performance over various intervals, such as every week or month for the past year. Strategic dashboard users, especially executives and managers, like to view standard reports along with the scorecard summaries.

Strategic dashboards are useless without meetings between managers and staff to review the results and discuss ways to improve performance. Strategic dashboards facilitate virtual meetings through use of annotations and threaded discussions. Strategy maps help executives work together to examine their assumptions about what drives business value in the organization and to make strategic course corrections as they go.

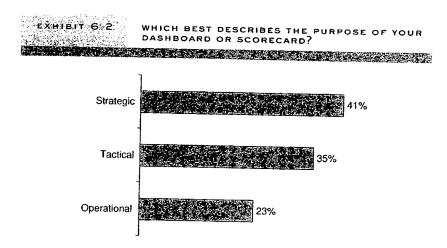
PERFORMANCE DASHBOARD TRENDS

Purpose

Strategic Dashboards Are Most Popular

Organizations are rapidly implementing all three types of performance dash-boards, but the most popular is the strategic dashboard. A survey of organizations that have already implemented a performance dashboard shows that 41 percent have implemented a strategic dashboard, 35 percent have implemented a tactical dashboard, and 23 percent have implemented an operational dashboard, using the definitions contained in this book (see Exhibit 6.2).

The popularity of the strategic dashboard is a testament to its allure in the executive suite. Many top executives gravitate to strategic dashboards like desert travelers to an oasis. They see it as an effective tool for keeping their fingers on the pulse of the organization without getting buried in detail. Credit goes to Harvard Business School professor Robert S. Kaplan and consultant David P. Norton for popularizing the Balanced Scorecard, the most popular type of strategic dashboard today.



A 2004 survey by The Data Warehousing Institute (TDWI) provided definitions of "strategic," "tactical," and "operational" that are the same as those used in this book. Based on 240 respondents.

Source: Wayne Eckerson, "Development Techniques for Creating Analytic Applications" (TDWI Report Series, The Data Warehousing Institute, 2004).

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Most Lack a Strong Foundation

Unfortunately, some strategic dashboards are not built on a strong foundation and will vanish quickly. In some cases, this is okay if the strategic dashboard is intended as a short-term management tactic to galvanize the organization around a new strategy or guide it through a challenging period. However, many strategic dashboards are simply not built to provide the depth of information and analysis required to deliver long-term business value.

For example, as soon as business users notice an out-of-bounds condition, the first thing they want to do is explore the cause. Without sufficient information embedded in the performance dashboard, they will become frustrated. They will have to work hard to find answers to their questions. They may have to create a custom report themselves or call someone to do it for them; worse yet, they may not consult information and may make assumptions about the source of the problem or issue. Unless a strategic dashboard helps business users resolve the issues highlighted on the scorecard interface, it will not provide much value.

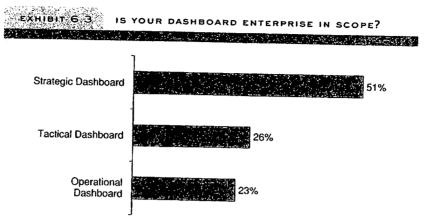
Recognizing these potential problems with a strategic dashboard, Hewlett Packard Co.'s Technology Solutions Group (TSG) built two distinct systems and linked them together: 1) a scorecard interface called Libra to display performance status of key performance metrics, and 2) a reporting system called Muse that lets users view both interactive and standard reports. Chapter 9 profiles Hewlett Packard TSG's strategic dashboard implementation and provides more information on how they constructed their system to meet business users' needs.

Enterprise Scope

Besides greater popularity, strategic dashboards also have more of an enterprise scope than either tactical or operational dashboards, according to the same survey by TDWI. A slim majority (51 percent) of strategic dashboards have an enterprise scope, whereas only 26 percent of tactical dashboards and 23 percent of operational dashboards have an enterprise scope (see Exhibit 6.3).

Top-Down Deployment

Top-down deployment makes sense because many strategic dashboards are initiated by the CEO to manage strategy better. Kaplan and Norton, the authors of the Balanced Scorecard discipline, encourage organizations to start building strategic dashboards at the CEO level and cascade them to all levels of the organization. However, strategic dashboards can also be initiated at lower levels of the organization, such as a region within a business unit, which is what Hewlett Packard TSG did. If designed properly, these regional or divisional strategic dashboards can spread quickly throughout the enterprise.



Data based on 240 respondents who answered "yes" to the question above.

Source: Wayne Eckerson, "Development Techniques for Creating Analytic Applications" (TDWI Report Series, The Data Warehousing Institute, 2004).

Bottom-Up Deployment

Conversely, tactical dashboards are generally deployed from the bottom up. These systems start small, focusing on one department, and spread outward to other departments. Some companies, such as the International Truck and Engine Corporation, have spread their tactical dashboards far and wide, spanning several business units and departments.

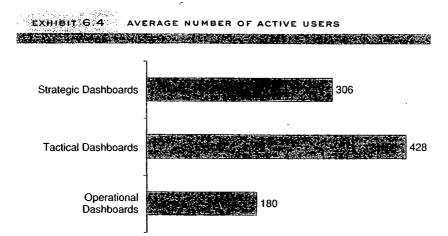
Departmental Focus

Operational dashboards almost always focus on a single department or subject area and rarely expand further. Most operational dashboards support specific operational processes that require specific sets of functionality or metrics that do not translate well to other departments. For example, a baking department in a process manufacturing company tracks oven temperatures by displaying a heat map alongside a numerical display. This type of dashboard display does not work well in other departments. However, other departments could create a distinct application using the same underlying infrastructure to meet their requirements.

Number of Active Users

Although strategic dashboards are more enterprise in scale, tactical dashboards support the most active users (i.e., who use the system at least once a week). On

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Data based on 240 respondents.

Source: Wayne Eckerson, "Development Techniques for Creating Analytic Applications" (TDWI Report Series, The Data Warehousing Institute, 2004).

average, tactical dashboards support 428 active users, strategic dashboards 306 active users, and operational dashboards 180 active users (see Exhibit 6.4).

Because tactical dashboards have been around longer than the other types of performance dashboards, it is not surprising that they have a higher number of active users. For the past decade, organizations have been building data warehouses and deploying reporting and analytical tools at the departmental level. Many are now rolling out data warehouses and BI tools on an enterprise scale. Leading-edge companies now report that they have thousands of internal BI users and tens of thousands of external BI users (i.e., customers and suppliers).

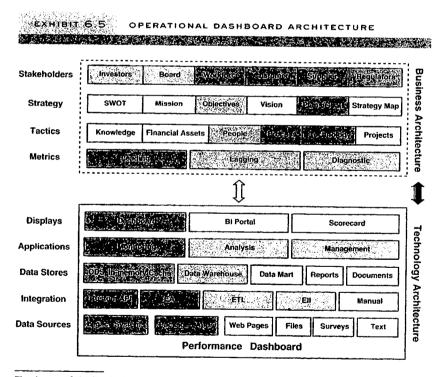
In the next five years, the average number of strategic dashboard users will grow significantly as organizations cascade scorecards throughout the organization. Most strategic dashboards today are still in their infancy. Many companies have yet to deliver more than a few downstream versions of the corporate scorecard. Operational dashboards will probably not grow much more than they have already, because their focus is fairly narrow, as mentioned in the paragraphs above.

The rest of this chapter will provide a quick profile of each type of performance dashboard, covering its purpose, architecture, and usage. Each section provides a quick summary of the case study profiles in the next three chapters.

OPERATIONAL DASHBOARDS

Operational dashboards are used by front-line workers and their supervisors to monitor and optimize operational processes. For example, store managers need to monitor inventory to avoid stock outs; dispatchers need to monitor the location, destination, and cargo of trucks to optimize carrying capacity and profits; plant supervisors need to monitor manufacturing quality and yields to meet shipment schedules and quality requirements; and call center managers need to monitor call volumes, call lengths, and resolution outcomes to ensure there are enough agents with the right skills to meet calling demand.

Operational dashboards use components from each layer of the performance management architecture described in Chapter 1. Exhibit 6.5 shows how operational dashboards use right-time infrastructure components and a dashboard interface to monitor business processes using leading and diagnostic metrics designed to achieve goals laid out in operational plans and satisfy the needs of customers, suppliers, and the workforce.



The degree of shading in the rectangles above shows the extent to which a component contributes to the business and technical architecture of an operational dashboard.

114 PERFORMANCE DASHBOARDS IN ACTION

For example, Quicken Loans, which is profiled in Chapter 7, uses an operational dashboard to help its mortgage consultants reach their daily quotas for sales and calls and provide optimal service to customers. Mortgage consultants use the operational dashboard in part to check their commissions, whereas managers use it to monitor which mortgage consultants are on track to make their daily quotas using leading indicators of performance. This makes both sales consultants and their managers stakeholders in the system, as indicated in Exhibit 6.5.

Dynamic Updates

Workers use operational dashboards to monitor business events that are captured and displayed on dashboards in seconds, minutes, or hours depending on the nature of the process. Some dashboards "twinkle," that is, data are dynamically refreshed as new events enter the system and are displayed. Others let users decide when to refresh their screens with new data.

In most cases, operational dashboards update data on a continuous basis. Updates either happen as soon as events occur (i.e., real time) or after a suitable lag time (i.e., right time), depending on when users need to see the data to make a decision. Most operational dashboards are updated on an intra-day basis, which is at least two or more times during a 24-hour period. (For more information on the origins of right-time updates, see Spotlight 6.1.)

SPOTLIGHT 6.1 FROM REAL TIME TO RIGHT TIME

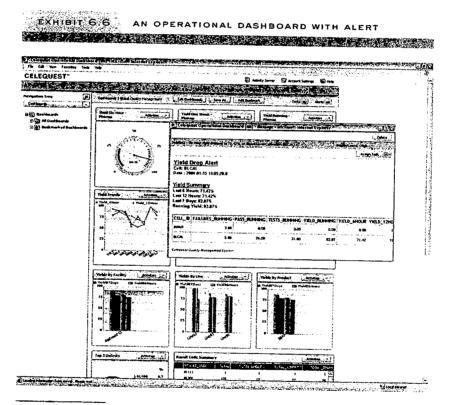
Two Interpretations. Technologists use the term real time to mean data that are updated instantaneously after an event occurs. Here, the latency between an event and when workers view it on a dashboard is zero. This has given lise to the notion of a "zero latency enterprise", which has gained prominence in some business circles. In actuality, it is difficult, expensive, and often unnecessary to deliver data in real time with zero latency. Most business people do not need to make decisions that rapidly.

Conversely, business people use the term real time to mean something that happens quickly. However, how fast is real time to them? Is it a second? A minute? An hour? In the end, the definition of real time varies from business person to business person. For example, airline executives interpret real time as anything that happens within 14 minutes because the dirline industry defines; on time, as 14 minutes or less from an aircraft's scheduled arrival or departure, according to Alicia Acebo, a former data warehousing manager at Continental Airlines.

Right Time. Perhaps, a better term to describe the timely delivery of information to decision makers is right time. Ultimately, business executives do not care about the degree of latency in a performance dashboard. They simply want the system to deliver the right information to the right people at the right time so they can make optimal business decisions. Right time puts the emphasis on the business value of information, not its latency.

Metrics

Most operational dashboards use diagnostic metrics to measure the output of ongoing processes, such as number of calls per hour by salesperson, oven temperature every minute for the past hour, product defects detected by thousand units, and so on. Operational dashboards often compare these numbers with recent historical data, such as performance during the past several hours, days, or weeks. When performance goes above or below the expected norm, the system triggers an alert. For example, a retail dashboard might alert a store manager when inventory for a particular product has been below target for the previous eight hours (see Exhibit 6.6).



This operational dashboard dynamically displays an alert indicating that a store is about to run out of a product, which needs to be reordered. The alert overlays a variety of graphical indicators, charts, and tables that adjust dynamically as the dashboard captures new events.

Source: Courtesy of Celequest Corporation, 2004.

Statistical Metrics

In addition, many operational dashboards apply statistical models and algorithms to current events to forecast future activity, optimize results, or identify hard-to-detect patterns. The metrics based on these algorithms help organizations work more proactively. For example, they can help organizations detect fraud as it happens, dynamically optimize pricing in response to sales, or anticipate product or system failures before they happen.

Simple Navigation

Although operational dashboards are not designed for complex analysis, they still make it easy for users to view different perspectives of the data or examine individual transactions or events. For example, a logistics manager who notices that a truck is behind schedule should be able to drill into the operational dashboard to find out the cargo the truck is carrying, the route it is taking to its destination, and the items it is scheduled to pick up when it gets there. This level of detail is critical if workers are going to optimize processes and maximize profitability.

Small Volumes of Data

Because the focus of operational dashboards is on monitoring rather than analysis or management, they usually do not store much information, usually a week or two of data at the most. In some applications, this may be less than a hundred gigabytes—about the amount that many laptop computers store today.

Most operational dashboards store events in an in-memory database or cache to provide exceptionally fast performance in response to user queries. There is no sense in making users wait several minutes for a screen to refresh or a query to return if they are monitoring events in real time. Data that are older than one day are usually transferred to an operational data store, another form of low-latency database designed to deliver small amounts of integrated data at rapid speeds. (See Chapter 3 for a more complete definition of ODS.)

Aliases

Operational dashboards are called many different things. For example, the Gartner Group, a technology research firm based in Stamford, Connecticut, uses the term business activity monitoring to describe applications that monitor and measure end-to-end business processes (see Spotlight 6.2). Another alias is business process management, a term favored by middleware vendors whose products transmit events in real time across a messaging backbone that interconnects many operational applications.



SPOTLIGHT 6.2 AN ALIAS FOR OPERATIONAL DASHBOARDS

Business activity monitoring (BAM) is a term coined by Gartner Group, a technology research firm, that describes a right-time system enabling organizations to monitor and manage business processes that span multiple systems, departments, and organizations. BAM is basically another label for an operational dashboard.

According to Colin White, president of BI Research in Ashland, Oregon, BAM systems exhibit the following characteristics:

- Event-driven processing model that captures events in real time from multiple systems that comprise an end-to-end business process.
- 2. Robust business rules that let users define alerts, targets, and thresholds for individual performance metrics.
- 3. A business-user-friendly dashboard that updates metrics as events flow through the system and puts metrics into context by relating them to business objectives.
- 4. A collaborative workflow system that lets one set up formal and informal processes by which users can collaborate and discuss results.

Although the Gartner Group and others have given BAM plenty of publicity, most business and technical managers find the term too abstract to comprehend. For example, Diaz Nesamoney, who founded Celequest, a BAM vendor, now pitches his system as an operational dashboard for managing business performance: "Once customers see our operational dashboard, they understand the benefits it offers immediately."

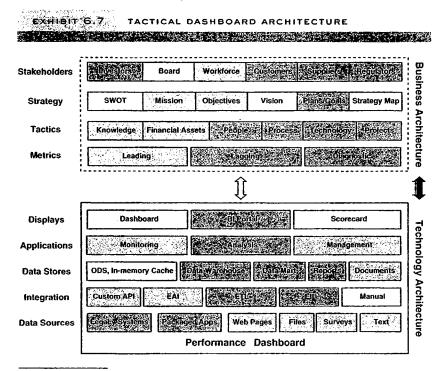
TACTICAL DASHBOARDS

Self-Service Access

The main benefit of a tactical dashboard is that it provides users self-service access to information instead of having to rely on the IT department to create a custom report for them. More importantly, it structures their exploration so they do not get lost in the data and can find what they are looking for quickly.

With freedom to explore information without getting lost, business managers use tactical dashboards to improve their understanding of the processes and activities for which they are accountable. Specifically, they use the systems to measure their progress against predefined goals, forecasts, or targets at the departmental or project level and drill into detailed data if they need to perform further analysis. Because managers do not need real-time information to manage their areas, tactical dashboards are typically updated daily or weekly, frequently enough to give managers and analysts time to absorb and analyze trends and take action.

Architecturally, tactical dashboards are much more "bottom heavy" than operational or strategic dashboards. Exhibit 6.7 shows that tactical dashboards draw from every type of source system imaginable and load the data into a data



The degree of shading in the rectangles above shows the extent to which a component contributes to the business and architecture of a tactical dashboard.

warehouse, data mart, or multidimensional database primarily using extraction, transformation, and loading tools. A tactical dashboard delivers information through a BI portal that lets users analyze primarily lagging and diagnostic measures using OLAP and other analytical tools to support departmental projects and initiatives. Key stakeholders are investors, who are interested in the financial information that a tactical dashboard can generate, as well as customers and suppliers (see Exhibit 6.7).

For example, the International Truck and Engine Corporation, which is profiled in Chapter 8, uses a tactical dashboard to give financial managers greater visibility into operations and help close their financial books faster at the end of each month. Of course, this makes investors and regulators happier and helps managers take more proactive steps to address costly problems on the factory floor that impact on supplier shipments, which makes suppliers a key stakeholder as well.

A "Reporting Portal"

In truth, a tactical dashboard is really a reporting portal designed for reporting and analysis. Instead of providing users with an endless list of reports like traditional BI tools do, a tactical dashboard displays the most critical metrics that users need to monitor based on their role and security profile. The portal interface lets users arrange these metrics on the screen any way they want, along with other documents, alerts, and files that are important to them. Tactical dashboards provide users with a single place on the Web where they can find all the information they need to do their work.

Analytics for All

Tactical dashboards focus heavily on the middle layer of a performance dashboard, which provides a multidimensional view of information. As we will see in Chapter 8, the ability of novice users to "slice and dice" data starting from highlevel graphical views of performance metrics is a hallmark of tactical dashboards.

Unlike traditional BI tools, which have been geared to technically savvy analysts and power users, tactical dashboards make it easy for casual information users to analyze data and find the reports they are looking for. Tactical dashboards give users the option to change perspectives on the data by switching business dimensions, such as product, location, channel, and time, or drilling down in more detail. Users can also modify the formatting of the view or report, take a "snapshot" of it, and send it to colleagues via e-mail or publish it to the dashboard.

Guided Analytics

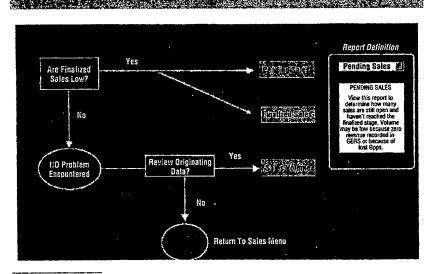
To assist casual users in getting to the root cause of a problem or deciding what actions to take, many tactical dashboards offer "guided analytics." These are built-in recommendations that show users which reports or views they should look at or what actions they should take based on the context of the information they are examining. These recommendations are generated by veteran analysts and then built into the software so less experienced users can literally follow in their footsteps.

Some guided analytics provide decision trees or other expert systems that guide users to the data they are seeking (see Exhibit 6.8). Other types are more subtle; they are built into the navigational pathways that users follow when drilling down or across dimensions and hierarchies in the data.

Meeting Diverse Analytical Needs

Casual users are not the only ones who use tactical dashboards. Business analysts and power users who spend most of their days analyzing data, crunching num-

EXHIBIT 6.8 GUIDED ANALYSIS



There are many ways to assist casual users to navigate through information or find the right reports. The example above provides a context-sensitive decision tree that helps users identify the most appropriate report to view and launch.

Source: Copyright © 2005 Direct Energy-Essential Home Services. Reprinted with Permission.

bers, and building forecasts also require access to multidimensional views and transactional views of data. Today, power users collect and analyze data largely in Excel spreadsheets and Access databases, which is cumbersome, time consuming, and expensive and creates the dreaded spreadmarts.

If designed properly, tactical dashboards can meet the needs of both casual and power users. The key is to create a BI environment designed to support the information needs of power users and then turn off functionality as needed to avoid overwhelming casual users with too many bells and whistles or pathways to explore. To be honest, not many companies have succeeded in doing this. Companies that have tried to purchase a single BI tool to meet everyone's needs usually end up with a power tool that alienates casual users. The power of performance dashboards is that they tip the balance the other way, in favor of casual users.

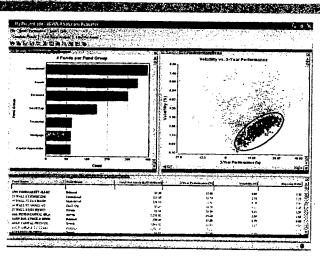
BI Vendors Step Up to the Challenge

On a positive note, BI vendors have made tremendous strides in the past few years in delivering flexible, role-based functionality geared to different analytical roles (e.g., authors create reports, managers interact with them, recipients view them). These so-called BI platforms support a range of integrated tools or modules that deliver role-based functionality to every type of user in an organization. Modules that run off the same extensible BI platform are tightly integrated and possess a common look and feel, reducing end-user training, and making it feel like they are using a single BI tool rather than multiple tools.

Analytical Dashboards

Some tactical dashboards are designed for heavy-duty analysis, a subtype called an analytical dashboard. Such dashboards expose rich navigational features that let users explore data by any dimension to any level of detail and provide sophisticated analytical techniques (such as linear regressions for forecasting "what if" analyses for scenario planning) and advanced visualization (see Exhibit 6.9).

EXHIBIT 6 9 TACTICAL DASHBOARD OR "ANALYTICAL DASHBOARD"



Some tactical dashboards are geared toward power users or business analysts and incorporate more complex navigation, statistical analysis, modeling, or advanced visualization techniques. The dashboard above displays a scatter plot and accompanying bar chart and data sheet. When an analyst highlights selected data points in the scatterplot, the bar chart and data sheet are dynamically updated, making it easier for analysts to identify correlations within the data, among other things.

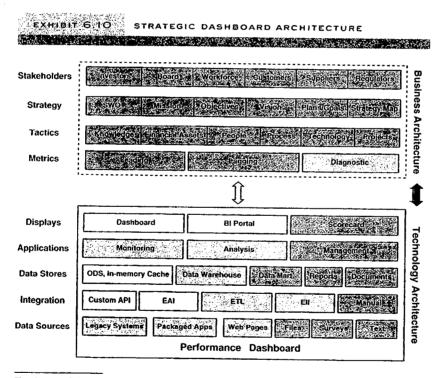
Source: Courtesy of ADVIZOR Solutions, Inc.

STRATEGIC DASHBOARDS

Executive Favorite

Many organizations are now beginning to implement strategic dashboards to measure and evaluate performance against strategic objectives and goals set by top executives. Ideally, strategic dashboards deploy customized scorecards to every group at every level in the organization, and sometimes to every individual. When deployed in such a hierarchical or "cascading" format, strategic dashboards help align the activities and efforts of all individuals, departments, and divisions in the organization.

Strategic dashboards are currently the tool of choice among executives to ensure that their strategy gets executed in the field. The most popular type of strategic dashboard today is the Balanced Scorecard. Architecturally, a strategic dashboard is top heavy compared with a tactical dashboard (see Exhibit 6.10).



The degree of shading in the rectangles above shows the extent to which a component contributes to the business and architecture of a strategic dashboard.

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A strategic dashboard measures, monitors, and manages an organization's strategy, which is designed to support all stakeholders. The strategy is executed using plans and resources and measured primarily, but not exclusively, using leading indicators of performance. These indicators focus executives, managers, and staff on the critical activities needed to optimize future results.

Technically, a strategic dashboard has a lighter-weight architecture than other performance dashboards, at least initially. A CEO who creates a corporate scorecard usually has a business analyst (or several) update it manually with text and numbers from Excel spreadsheets, desktop databases, surveys, and e-mail messages. Eventually, however, the organization will want to cascade unique versions of the corporate scorecard to every group in the enterprise and begin tracking additional metrics. At this point, it needs a more robust infrastructure, including data marts, data warehouses, and data integration tools, to ensure that the performance management system scales to meet user requirements and system loads.

Most strategic dashboards are updated monthly or quarterly, because strategic objectives tend to encapsulate long-range goals. However, the further down that an organization cascades its scorecards, the more frequently it will need to update information in the strategic dashboard system. All cascaded scorecards should run off the same strategic dashboard to avoid creating inconsistent views of enterprise information.

A strategic dashboard uses graphical indicators to compare performance against predefined targets and thresholds and to signal whether performance is trending up or down and how results compare with targets and thresholds. Metrics consist primarily of leading indicators, although many strategic dashboards also incorporate lagging and diagnostic measures (see Exhibit 6.11). Often, a strategic dashboard contains metrics that are qualitative in nature, such as customer satisfaction scores, which may be gleaned from surveys conducted and/or verified by external groups.

Management and Analysis

The first thing users want to do when they see that the performance status of a metric is below target is to find out what is going on. A strategic dashboard needs to let users drill down in more detail or access reports or other documents to understand what is causing the alert or variance. In other words, strategic dashboards are not just scorecards; they are layered performance management systems that let users monitor, analyze, and manage critical activities and optimize performance results.

Management Features

Strategic dashboards also provide many management features to help communicate and execute strategy. Executives use strategy maps to identify and link